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WITH WHICH ARE INCORPORATED

THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER

ELECTRO-PLATERS REVIEW

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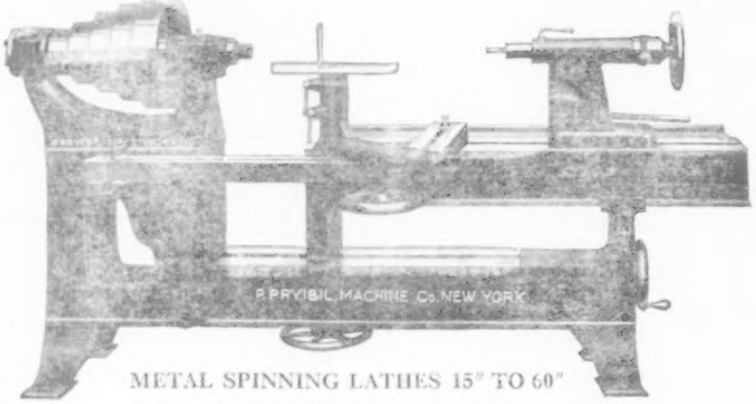

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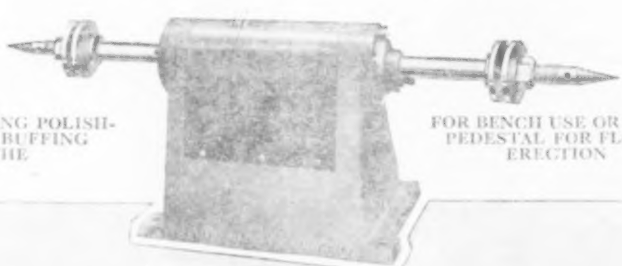

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ELECTRO-PLATERS REVIEW.

Vol. 20 New York, June, 1922 No. 6

The Metal Trades Convention

A Report of the Joint Meeting and Exhibition of Foundry Equipment Held at Rochester, N. Y., June 5-9, 1922

The Rochester Convention was a success. In spite of two years of depression, the turnout amounted to over 150 exhibitors and 2,300 visitors—a remarkable record considering the conditions. The general atmosphere was one of hope and confidence for the future. Business seems to be better and although many are still pinched, they are seeing light ahead.

Among the interesting exhibits was an unusual variety of new types of furnaces shown by the Monarch Engineering and Manufacturing Company of Baltimore, Md. A new aluminum iron pot furnace with arrangements for using the spent gas at the top of the charge was shown. Iron melting "cupolettes" were also exhibited. They are small cupolas for melting a quick heat in case of an emergency. It is also probable that they could be used for copper bearing materials and lead bearing materials. A new Monarch burner was also exhibited, and the Monarch Monometer, a new white metal melting furnace with automatic temperature regulation and bottom outlet for the metal, was shown.

The Balbach Smelting and Refining Company of Newark, N. J., had a most interesting exhibit showing their various products. This company has now broadened into the manufacture of alloys of all sorts. It is one of the oldest copper refining companies in the country and has a reputation for its copper which it intends to uphold with its newer products. The exhibit included casting copper ingot, ingot bars, yellow and red brass ingot, desilverized lead, antimonial lead, solders of various sorts, blue vitriol crystals, gold, silver, platinum and palladium.

The Electro Refractories Company of Buffalo, N. Y., showed their Tercod crucibles, which are said to have unusual wearing qualities. It was stated that their crucibles, varying in sizes from No. 40 to No. 100, would average 100 heats per pot.

The Lava Crucible Company also exhibited crucibles which were said to have an unusual long life. It was stated that reports from customers showed pots up to No. 100 in size averaging over 90 heats.

Mechanism of Metallic Oxidation at High Temperatures

By N. B. PILLING AND R. E. BEDWORTH, WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, PITTSBURGH, PA.

A theoretical discussion of the mechanism of oxidation of metals—the first explanation of this phenomenon ever read before the Institute. Metallic oxidation follows the equation:

$K = ATn$
K = rate constant
T = absolute temperature
A and n = characteristic constants.

Aluminum and cadmium behave in an anomalous manner in that oxidation proceeds according to the above law as is required by their density rates, until an oxide coating which is truly hardly more than a film is formed, whereupon further oxidation ceases. At a temperature of 600° C. this flow forms upon aluminum in about 60 hours, and further exposure up to 900 hours brings about no increase. This critical oxide weighs about .0001 gm/cm^2., corresponding to a thickness of .00002 cm.

The Extreme Sensitiveness of the Action of Reducing Atmospheres Upon Heated Copper

BY T. S. FULLER, GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

The writer is doubtful if many appreciate the extreme sensitiveness of the action of very slightly reducing atmospheres on ordinary heated copper.

The desirable mechanical properties of ordinary copper are completely destroyed by electrically heating to 800° C. in air for one hour in an iron pipe filled with sea sand—two substances which are not usually regarded as sources of reducing atmospheres.

The ductility of the metal is destroyed by intergranular cracks which probably result from the formation, accumulation, and subsequent pressure of a gas resulting from the reaction of the reducing gas upon the oxide present in the copper.

Oxygen free copper is not affected by this treatment.

Ordinary copper becomes brittle when heated in a steel pipe packed with Al_2O_3, or when heated in a porcelain tube packed with sea sand, unless the sand be first heated four hours at 600° C. to remove organic matter.

Very slightly reducing atmospheres for long periods of time have much greater effects than highly reducing atmospheres for short periods of time.

DISCUSSION

MR. PILLING—Hydrogen will penetrate through molten salt, but it acts slowly under low pressure. Gas from sea sand is really of large volume (from organic matter) at a temperature of 800° C.

Copper is not really so very sensitive at high temperatures, which is evidenced by the fact that it can be cut and welded with an oxy-acetylene flame without injury.

Mr. Fuller—The effect of hydrogen may be slow, but the attack on the surface is quick, causing cracks and allowing the gas to penetrate further.

Some Electrical Properties of Nickel and Monel Wires

By M. A. HUNTER, F. M. SEBAST and A. JONES, Rensselaer Polytechnic Institute, Troy, N. Y.

Pure nickel with a low specific resistance and high temperature coefficient may be produced by melting electrolytic nickel with the addition of a minimum amount of manganese. The time for melting is a material factor in the production. The effect of various impurities is also indicated.

The variation of resistance with temperature for various grades of commercial nickel and of monel metal has been investigated. From the resistance temperatures curves, the transformation points have been obtained.

Technical Control of the McCook Field Foundry

By E. H. DIX, Jr., Engineering Division Air Service, McCook Field, Dayton, Ohio.

The exacting demands of aircraft construction requires strict technical control of foundry operations. To meet this need a small foundry was built at McCook Field for the purpose of making nonferrous castings for experimental work. The melting equipment consists of two stationary and one tilting crucible furnaces arranged for oil or gas fuel and an electrical crucible of the induction type. The technical control embodies temperature control, chemical analysis, physical testing and mettallographic examination. The author points out the likelihood for error in attempting to judge temperatures by the appearance of the metal and describes methods employed in the air service foundry to determine temperatures. The importance of chemical analysis is emphasized. In physical testing, the method of obtaining test bars is of the utmost importance. The author describes and illustrates the methods employed at McCook field. The procedure in making metallographic examinations of metal is outlined and the manner of correlating all four phases of technical control is explained. Various reports and records which assist in the administration of technical control are described and illustrated.

DISCUSSION

Mr. Jones—Manganese bronze can be judged by a simple bending test. A bar 15" to 20" long and 1" by 1½", slowly cooled and bent with a sledge will indicate its elongation and ductility by the amount of bend it will take.

The metallurgist must co-operate with his foundry superintendent and foreman in order to get best results. The technical man must understand the work of the practical man or technical control will not succeed.

The Selection of Fuels and Furnaces for Melting Copper and Brass Alloys

By T. H. A. EASTICK*

Under the pressure of competition in the nonferrous foundry, the selection of proper fuels and furnaces for melting becomes an important problem. It should be understood that there is no universally "best furnace" or "best fuel." Each melting problem must be considered separately, and in most cases the "best equipment for the purpose is a compromise between conflicting furnace types and designs and fuels. In selecting fuels, too much value should not be placed on the cost and heat value; the "form value" is also an important consideration. The furnace should be selected after considering the average weight of castings to be produced, the chemical metallurgical characteristics of the metal, diversity of products, and initial investment, interest, depreciation and other economic factors.

*Deceased.

DISCUSSION

Mr. Jones—There seems to be a reversion of feeling about electric furnaces. Two years ago the tendency was strongly in their favor. Now, for one reason or other, foundrymen are going slow.

Mr. Patch—We have used electric furnaces with satisfactory results. They are not a cure-all, however. All melting consists of fuel, furnace and brains, the brains being perhaps the most important.

An Investigation of "Segregation" with a View to Preventing Its Occurrence in Castings Made of High-Lead Bronzes

By R. E. LEE and F. B. TRACE, Allegheny College, Meadville, Pa.

Experiments were performed on bearing bronzes up to 30 per cent in lead. Good foundry practice consists of the following:

1. Charge scrap or virgin metal.
2. Metal must have no impurities.
3. Heat melt to 2000° F.
4. Pour at not less than 1800° F.
5. Puddle and mix steadily between removal from furnace and pouring.

GROUP OF EXHIBITORS AT THE ROCHESTER CONVENTION

6. Add phosphor copper just before pouring and mix thoroughly.

7. Skim pot and pour.

8. Use dry sand, firmly rammed.

9. If virgin metal is used the melt must be heated to a higher temperature, say 2200° F.

A theoretical explanation was given, sketchily, for the reason for heating to 2000° and then not pouring at less than 1800°. As the paper was not available in preprint form this was not made clear to most of those present. Some disagreed with the author's explanation of the mechanism of crystal formation between 2000° and 1800°. Mr. Lee stated that impurities were not primarily responsible for segregation; that thorough mixing alone would not prevent it; that the important point was proper temperature of melting and pouring.

Nickel, Its Metallurgy, Its Properties and Uses

By W. M. CORSE, Secretary, Institute of Metals Division.

A history of nickel and an explanation of its recovery from mine to ingot. The lecture was illustrated by moving pictures. Figures for the consumption of nickel in various industries were given as follows:

Nickel steel, 60 per cent of total production; nickel silver, 25 per cent; nickel plating, 5 per cent; malleable nickel (that is nickel with the addition of .1 per cent magnesium), 5 per cent; miscellaneous, 5 per cent. Total production from 40 to 80 million pounds per year.

Use of Secondary Aluminum Larger in Foundry Practice

By W. M. WEIL.

For using secondary aluminum the three points of importance are (1) temperature, (2) fluxing, (3) shrinkage. Oxidation, of course, causes trouble, the finely divided oxides being trapped between crystals and causing weakness. A good flux is zinc chloride or sodium chloride. Copper chloride can be used, but it is too expensive for general use. The flux should be introduced after the removal of the dross. It must be completely immersed and held under the surface until ebullition ceases. Then skim and pour.

Sponginess is another difficulty. To avoid it the mold should be of green sand, lightly rammed and with soft cores, which will crush easily. Use rosin for a binder. Chills are undesirable and should be avoided wherever possible, as they cause hard spots. Gating and venting is very important. The impinging of the molten metal against obstruction causes frothing. There is no "drag" in machining secondary metal as with primary.

DISCUSSION

Questions were asked about the methods of keeping the zinc submerged in the melt, and several suggestions were made by Mr. Weil and others. Mr. Weil stated that all but about 2½ per cent of the oxides could be removed. A little fluorspar can also be used in the bottom of the pouring ladle.

Mr. Pilling stated that chilling was often necessary to eliminate inequalities in cooling rates, and no hard spots should result.

The Effect of Impurities on the Oxidation and Swelling of Zinc and Aluminum Alloys

By H. E. BRAUER and W. M. PEIRCE, New Jersey Zinc Company.

(a) Investigation of Pure Zinc-Aluminum Alloys

We have found that by disintegration, exfoliation and intercrystalline corrosion is due to intercrystalline oxidation which attacks α but not γ.

When the β constituent is decomposed into α and γ, the resulting structure offers an enormous number of secondary grain boundaries in which oxidation can occur.

Expansion measurements show that quenching from above the decomposition temperature of β increases the expansion. This may be due to the fact that some undecomposed β remains and is especially susceptible to oxidation or it may be due to a finer particle size in the decomposed β or to both.

This oxidation occurs at a rapid rate in wet steam. Six months' exposure in dry air at 100° C., however, has produced no attack. Moisture appears, therefore, to be essential. The grain size of zinc-aluminum alloys decreases with increasing aluminum content and in coarse grained alloys (alloys below 2 per cent aluminum) the depth of penetration is great though the expansion may be slight.

The severity of intercrystalline oxidation as affecting the physical characteristics of a specimen depends upon the grain size and the presence or absence of impurities, or other metals added in the alloy.

(b) Investigation of Zinc-Aluminum Alloys Containing Other Metals

Certain metals when present even in hundredths of a per cent accelerate the oxidation noticeably. Lead is the most powerful accelerator. Cadmium and tin are nearly as effective. Iron is somewhat less active. Nickel and manganese when present alone in zinc aluminum alloys are moderately detrimental.

Copper to the extent of 0.5 per cent is a powerful retarding agent and in any amount up to 5 per cent is more or less beneficial.

In dense castings of fine-grained alloys free from detri-

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mental impurities the rate of penetration is very small and uniform resulting in a slight expansion without distortion. The density of the castings, however, is of prime importance.

DISCUSSION

The authors added that a good casting alloy consisted of 5Ae, 3 Cu, and 92 Zu.

DR. MATHEWSON gave a slow history of the investigation and commended the paper highly.

MR. BIERBAUM—The worst impurity in zinc-aluminum-copper alloys is tin. The same effect results as by the addition of tin to aluminum alone. I do not believe it is caused by oxidation alone or disintegration caused by heat or moisture. Three causes of trouble are:

1. Constitutional changes without heat or moisture.
2. Disintegration due to oxidation by heat or moisture.
3. Chemical composition which is stable at high temperatures, but not at low.

Aluminum and Aluminum-Alloy Melting Furnaces

BY ROBERT J. ANDERSON, UNITED STATES BUREAU OF MINES, PITTSBURGH, PA.

The author reviews the work undertaken by the United States Bureau of Mines to decrease metal and fuel losses in melting aluminum and its light alloys. The author makes the statement that if the present net losses could be reduced 50 per cent a saving of about $1,500,000 per year would accrue. The selection of the correct type of furnace for a given set of operating conditions is specially difficult because of the many different types of furnaces available and more particularly because of the lack of comparable data regarding each one. All of the types of furnaces used in the United States for rolling mill practice, foundry practice, for die casting and permanent mold practice and for smelting and refining are mentioned in the paper. Detailed information and descriptions are given of pit, stationary and tilting crucible, stationary and tilting iron pot, open flame, reverberatory and electric furnaces. In conclusion the factors governing the selection and operations of furnaces are outlined and information regarding melting temperatures is presented. As an appendix to the paper the author presents a selected bibliography in which many articles pertaining to aluminum and aluminum alloy melting furnaces are listed.

DISCUSSION

MR. SKILLMAN—What do you consider the best furnace?

MR. ANDERSON—There is no one best furnace. In general, iron pots are best for small work; reverberatories, or open flame furnaces, for large output. Not enough is known about electric furnaces.

A general discussion ensued as to the merits of crucibles against iron pots. It developed that experiences with iron pots varied widely, but the average was about 50 to 60 heats for a pot holding 400 pounds.

MR. WEIL stated that he had got as many as 300 heats from a pot by observing the following practice:

1. Keep the flame from striking the pot; it should enter at a tangent 12 inches below the pot.
2. The pot should be of small diameter, but deep.
3. Sand blast the pot before using; then coat with a mixture of lime and sodium silicate.
4. At the end of each day scrape and rewash with the above mixture.

The furnace operator must be very skilled to manipulate his burners properly.

Melting Aluminum for Rolling Into Sheet

BY JOHN A. LANGE, WESTERN SPRINGS, ILL.

In order to determine the most suitable type of furnace for melting aluminum for sheet rolling, the author conducted tests on melting pots, and tilting reverberatory, and two types of combination revolving and tilting reverberatory furnaces. The combination revolving and tilting units were similar in design, but the lengths of the revolving drums and speeds of rotation were different. Of the four furnaces tested, the one giving the best results was a combination revolving and tilting reverberatory units having a capacity of 1,000 pounds of aluminum. It was equipped with a motor driven proportional mixer; the drum was 96 inches long and revolved once every 4 minutes and 25 seconds. The author describes the melting practice employed with this furnace, and gives comparative data for all four units. In conclusion he recommends quick melting with a furnace temperature not exceeding 1,800° F. Although the drawing quality of the metal does not depend entirely on analysis, the author warns that silicon is objectionable, and that iron should not exceed 0.005 and copper 0.0033 per cent, for the best results.

Cracks in Aluminum Alloy Castings

BY ROBERT J. ANDERSON, METALLURGIST, BUREAU OF MINES, PITTSBURGH, PA.

The most important factors are: (1) Contraction in volume; (2) composition of alloy; (3) quality of melting charge; (4) design of casting; (5) method of molding; (6) hardness of ramming; (7) method of gating; (8) hardness and characteristics of cores; (9) chills; (10) risers; (11) melting temperatures; (12) furnace used for melting; (13) pouring temperatures; (14) inclusions in alloys; (15) hot shortness of alloys; and (16) physical properties of alloys at high temperatures. Of these, the first, second, third and eleventh to sixteenth involve ascertainable metallurgical facts; the remainder are largely matters of opinion, judgment, and technical knowledge of men experienced in the production of castings.

Temperature Problems in Foundry and Melting Room

BY JOHN P. GOHEEN, SECRETARY, THE BROWN INSTRUMENT COMPANY, PHILADELPHIA, PA.

The paper dealt with pyrometers for use on brass and bronze. It covered pyrometer equipment for electric brass melting furnaces, special equipment for brazing brass, core-oven temperature control and the value of annealing.

Core Oven Tests

BY F. L. WOLF AND A. A. GRUBB, OHIO BRASS COMPANY, MANSFIELD, OHIO.

The authors conclude that power or fuel costs are decidedly in favor of the oil-fired oven while other considerations such as quality and uniformity of bake, core losses, convenience and cost of tending, cleanliness and noise are decidedly in favor of the electric ovens. Taking into consideration the higher losses in the oil-fired oven and the extra labor cost, the oil-fired oven cost about $0.80 per bake as compared with $1.63 for the electric oven. All of these considerations are based on the equipment and installation they now have and the present methods of manipulation, both of which they are trying to improve.

The authors stated that the ovens ran 275 to 300 pounds per bake and 10 bakes per day per oven.

Occurrence of Blue Constituent in High Strength Manganese Bronze

BY E. H. DIX, JR.

1. When the hardening elements (aluminum, tin, iron and manganese) are added to the 60-40 copper-zinc alloy in sufficient quantities to produce a high-strength manganese bronze, a third constituent appears in the alpha-beta prime complex, which has a characteristic clear blue color.
2. The occurrence of this constituent in reasonable amounts is not necessarily accompanied by brittleness.
3. Annealing for 7¾ hours at 1,560° F., followed by either water quenching or slow cooling, does not cause the disappearance of this constituent.
4. This constituent, when examined unetched, appears

to be of a deeper blue than either the delta constituent of the copper-tin series or the gamma constituent of the copper-zinc series. When etched with NH_4OH plus H_2O_2, the blue constituent is unattacked except for a slight eating away at the edges under prolonged etching, whereas the gamma constituent with the same reagent is immediately tarnished and rapidly dissolved. The characteristic shape of the blue constituent is decidedly different from that of the delta of the copper-tin alloys.

5. For practical purposes in the study of the microstructure of manganese bronzes, it seems highly desirable to regard the blue constituent as distinct from either the delta or gamma, and it is suggested that it may reasonably be denoted as delta prime.

6. In the manufacture of manganese bronze, the particles of delta prime are precipitated from the copper-rich solution by the addition of the zinc. This precipitation is strongly influenced by the presence of iron and, therefore, the particles probably consist of a solid solution of iron and copper with or without some tin, aluminum or manganese.

DISCUSSION

MR. DIX—The practice at the McCook Field consists of the following:

Composition: Zn-40, Al, Sn, Fe, Mn—0 to 1 each.

Molding: Same sand as for brass. Do not ram too hard. Use skim gate, large risers and few chills.

Temperature—Keep low; on remelt, not over 1,700° to 1,800° F. Cool slowly in sand.

MR. COMSTOCK—The blue constituent I believe is a zinc-copper-iron compound. It may be the most important difference between manganese bronze and ordinary Muntz metal.

MR. DECKER—Does this blue constituent make it hard to machine manganese bronze?

MR. DIX—Not if well distributed.

MR. BIERBAUM—I do not believe that the blue constituent is a primary compound; it is probably a transition compound.

Some discussion followed on the method of introducing iron into the melt. Old hack-saw blades were recommended by MR. KRODEL, but most of those present felt that the carbon in them would be injurious. Wrought iron and Armco iron were recommended. MR. PAULSON asked if charcoal in the crucible might not have the effect of adding carbon to the melt, but MR. DIX thought it would not.

Gas Absorption and Oxidation of Non-Ferrous Metals

BY B. WOYSKI AND JOHN W. BOECK, BEARING COMPANY, BUFFALO, N. Y.

The most important cause of gassing molten metal is the furnace atmosphere. Gassed metal can be brought back to normal condition by remelting in an oxidizing atmosphere. A reducing atmosphere is more troublesome than an oxidizing one. Defects caused by gas or shrinkage may leave a similar appearance to those caused by oxidization and are aften mistaken for such.

DISCUSSION

DR. MERICA—In copper-base alloys the difference between gassing and oxidation is clear and easy to recognize. In high nickel alloys, however, it is not so evident, because carbon is present, and forms CO.

MR. ANDERSON—It is almost impossible to say whether the furnace atmosphere is reducing or oxidizing without analyses. More data should have been given. How was the atmosphere judged?

MR. WOYSKI—The atmosphere was judged by the appearance of the flame. Sampling was impossible because the atmospheres varied in every part of the furnace.

MR. ST. JOHN—In the Detroit electric furnace, whether the vent is open or closed, there is practically no difference in the results on the metal or the atmosphere; it consists largely of CO. Even when the vent is closed the pressure within is only a few ounces, and will therefore, not drive gases into the metal. Moreover, copper, although it absorbs CO above 2,200° F, will give it up. if cooled to 2,100° F.

MR. SKILLMAN—The idea of meeting under an oxidizing flame is new to me. Would such conditions work with high lead bronzes? I am inclined to doubt it. In the electric furnace it is very hard to get an oxidizing atmosphere, whether the vent is open or closed. We keep it open to relieve pressure.

MR. PRICE—We melted some copper in a Bennett furnace, with no flux. There was no CuO, but many gas holes. Once we overheated a charge to 1,400° C. The electrodes were then withdrawn and the charge door left open for an hour. It was poured at low temperature. The ingot, weighing a ton, was absolutely sound. On analysis, dissolved gas N, CO, CO_2 were found.

MR. WOYSKI—When we recommended an oxidizing flame in our paper we did so as against the reducing flame. The ideal flame is neutral, but it is so difficult to obtain that it is safer to keep the flame slightly oxidizing. This is especially true of aluminum bronze.

Interesting Unsolved Problems of the Foundry

BY W. M. CORSE.

The writer outlined a number of unsolved practical foundry problems with the suggestion that research work be done on them. Some of the problems were as follows:

Why does aluminum do so much harm when added to red brass or composition metal?

Why does aluminum produce a smooth surface on a casting when added to yellow brass?

Why is aluminum beneficial in slab sinc?

Why is phosphorus a good deoxidizer in tin bronze and a bad one in zinc mixtures?

What is the role played by sulphur and nickel in copper-lead alloys?

What is the exact relation between patternmaker's shrinkage and casting shrinkage?

Why does an alloy of high contraction usually have a high tensile strength?

These questions are on subjects about which our knowledge is not yet completed and are intended to stimulate research and invite discussion.

DISCUSSION.

MR. PATCH—I would suggest that a committee be appointed to undertake work of investigating problems of this sort. There is a great deal of work still to do and it should be attacked systematically instead of hapharzard fashion as in the past.

MR. PRICE—Dr. Merica, chairman of the Papers' Committee, will be glad to receive suggestions for a symposium on such topics.

MR. PATCH—One of the problems of vital importance is the relation between the ideal test bar and the test bar cut from a normal section of a casting. There is, of course, often a wide difference between the properties exhibited by these two types of bar, and their relation should be investigated.

MR. CORSE—I am heartily in favor of Mr. Patch's suggestion. Engineers do not understand these conditions and are prone to believe that they can figure on the tensile strength of a material in accordance with the properties exhibited by ideal test bars.

MR. BIERBAUM—Each casting should be tested in every part under different conditions of gating and venting.

MR. DIX—The Engineering Division at McCook Field in Dayton is putting this scheme into operation. We are testing all castings by means of bars cut from various sections. Extreme care is necessary because in many cases lives depend on the parts being made.

Producing Two-Part Castings in Three-Part Molds

The Author Shows How a Certain Job Which Was a Failure When Attempted in a Two-Part Mold, Was Successfully Poured in a Three-Part Mold*

By WILLIAM H. PARRY

On first thought advocating the use of three-part flasks in making castings usually molded in two-part flasks would appear an absurd proposition. However, there are conditions surrounding the rapid production of sound castings for pressure work which tax the ingenuity of the most expert foundrymen, and in the opinion of the writer, many of the difficulties can be removed by employing the three-part mold.

In these days of the almost universal use of production pattern-plates, it is not unusual to find that such plates do not always produce as many good castings as the number of patterns on them would indicate; in fact, in many instances not one good casting has been found among the great number cast.

It is not claimed that improper gating is the cause of these failures in all cases, but there is no question but what it is a contributing factor in a large percentage of lost castings.

In designing production pattern plates it is not always a good policy to crowd as many patterns into the confines of the flash spaces as possible, with the idea of increasing production, because frequently the result is exactly the reverse of what was intended. The number of plate patterns is restricted to the spaces not occupied by the runners and necessary connecting gates.

MAKES MOLD IN THREE PARTS

Fig. 1 illustrates a staggered section of a three-part mold assembled, showing the sprue and runner in the cope, the pop gates and the upper part of the castings in the cheek, and the lower part of the castings in the drag.

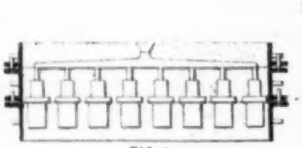


FIG 1

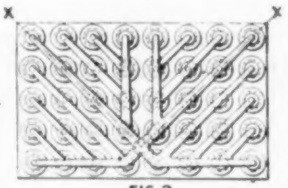


FIG.2

FIG. 1. STAGGERED SECTION OF THREE PART MOLD

FIG. 2. POSITION AND NUMBER OF PATTERNS ON PLATE

Fig. 2 shows the position and number of patterns on the plate or plates and the arrangement of the runners and gates. Fig. 1 is a section of Fig. 2 on the lines x-x.

It will be noted that this is an apparently simple two-part job. At first, the work was planned for a two-part mold with gates attached to the flanges and two runners running lengthwise. The castings were to stand a hydrostatic pressure of 1000 pounds per square inch after being finished all over, and hundreds of thousands of them were needed badly. However, every casting produced in this manner was porous and therefore it was evident that some other method of gating must be tried.

Pattern plates were made by the dozen each embodying some new method, but they all failed. Finally, a mechanic not connected with the foundry force, suggested the "three-high" idea. When he tried to explain how a two-part job could be better made in "three boxes" of sand, he was considered insane; nevertheless in desperation the foundry management tried his scheme. It succeeded beyond even the wildest hopes of the man who suggested it.

Three plates were made, the one for the cope being rigged with the runners and about one half of the sprue height, as shown at Figs. 1 and 2. The cheek plate accounted for the upper parts of the castings. Pop gates were attached to each of the 40 patterns, projecting upwards just high enough to come flush or a trifle under the flask height and engaging with the runners at points shown at Fig. 2. The drag plate was mounted with the larger of the two hubs. The sprue was so placed that the inrushing metal did not pour directly into one casting cavity, while the runners were designed to give the most direct passage to the metal.

POURED FORTY CASTINGS PER MOLD

As tight flasks were used, it was possible to pour 40 sound castings to each mold. This was 17 in excess of the number of patterns spaced on the two-part flask plates as originally designed, and from which not one casting free from porosity was obtained.

One decided advantage in using the elevated runner method is that no attention need be paid to the runner or gate positions in placing and spacing the patterns other than to keep in mind that they must not be staggered so that the runner shape departs from easy flowing lines. However, a fair variation from a straight line is allowable. Again, this method lends itself to direct pouring into the casting cavities and provides feeders to counteract gravity shrinkage in castings with heavy and deep sections on each side of a light flange.

On the original two-part flask plates, the gates engaged with the flange so that the metal first flowed down then up in the cope. The upper hubs did not always fill, and when they did, sponginess was to be found at the junction of hub and flange.

In Fig. 3, *A*, *B*, *C* and *D* show four quarter layouts of a similar piece on split pattern plates, half on each side. The illustration indicates that many patterns can be placed on plates without any attention being paid to gates and runners, as they would be provided for in the cope of a three-high mold. If the layouts as at *A*, *C* and *D*, Fig. 3, are followed, 28 castings are possible, while if *B* is employed 26 can be obtained. This is at least eight in excess of what could be expected from the two-part flask method.

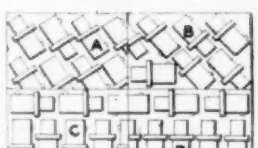


FIG.3

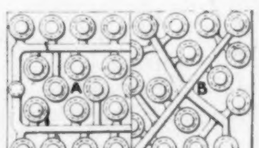


FIG.4

FIG. 3. FOUR QUARTER-LAYOUTS OF A CASTING ON PLATE

FIG. 4. TWO HALF-LAYOUTS. OLD METHOD.

This well repays the extra labor of ramming up a shallow cope to form the overhead runner. Pop gates are not shown on these layouts, though they can be placed on either hubs or flanges, their position at times being determined by the ease with which they can be separated from the castings or located so that the following machin-

ing operations will remove all evidence of their presence.

In Fig. 4 the two half layouts *A* and *B* show the antiquated runners and gates usually employed to coax the metal into a two-part flask mold in an attempt to get sound castings. Layout *A* provides for a barely possible maximum of 33 castings with a chance of losing one-third of them, while layout *B* can be crowded to account for 29 with a fair chance for a 25 per cent loss. The estimated loss percentages are in favor of layout *B*, because of the shorter run of the metal and the likelihood that some of the cavities in layout *A* will be filled with air only.

Fig. 5 is a layout of midway gating to the flanges, the

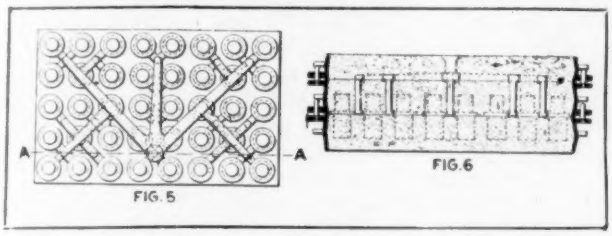


FIG. 5. LAYOUT OF MIDWAY GATING TO FLANGES

FIG. 6. FEEDING 60 CASTINGS WITH 16 FEEDERS

metal being fed from the top runners located in the cheek and through uprights shown in section at Fig. 6. No great advantage in using this method is apparent other than that it may prove convenient on work that must be poured into the midsection of the casting.

Fig. 6 is a section of Fig. 5 at *AA* and illustrates the possibility of feeding 40 castings with only 16 upright feeders. This arrangement is of rather dubious advantage, but it can be adapted to some classes of work. Fig. 7 serves to illustrate how bad a runner layout can be to offset the virtues claimed here for overhead or bottom pouring.

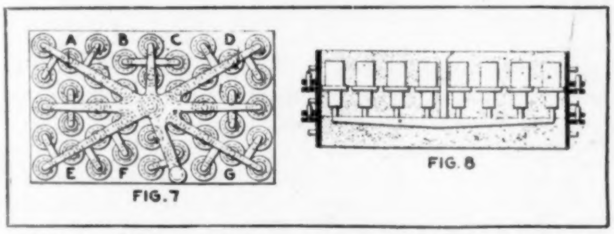


FIG. 7. POOR RUNNER LAYOUT

FIG. 8. BOTTOM POURING WITHOUT HORN GATES

It will be noted that 41 castings are expected from this plate. This number is obtained by crowding as many patterns as possible within a prescribed space, regardless of future consequences. Nevertheless, with all the crowding, there are seven waste spaces—*A, B, C, D, E, F* and *G*—which could be utilized as in Fig. 2, where the runners are laid out so that a mass of metal will not form at the sprue position as in Fig. 7. This condition, as illustrated in Fig. 7, is likely to create serious trouble when cooling.

BOTTOM POURING WITHOUT HORN GATES

Fig. 8 shows how bottom pouring is made effective without horn gates. Bottom pouring is no more expensive than the ordinary method and is successfully employed on pressure work. Note how the sprue passes through the cope and cheek feeding the runners, gates and 40 castings just as easily as the old-fashioned horn gate fed one casting. At a matter of fact, it is easier by this bottom pouring scheme to make 40 or even a hundred castings than one with the horn gate. This would appear to be a wild statement, but on analysis it develops that the handling of a single horn gate to place in correct position, or near it, and keep it there, involves molding skill of a high order. Moreover much time is consumed in the operation. The delicate job of curving out the gate, while simple enough, requires an excessive amount of time.

On the other hand, with a three-part mold, a man with a machine, proper flask equipment, and good pattern plates can ram up two or three complete molds (40 castings to a mold) and can pour them off before the man using the horn gate method closes down his one mold containing a single casting.

In giving publicity to a scheme that involves the ramming of an extra flask, be it ever so shallow, to pour castings that are usually made or spoiled in two-part flasks the writer is not unmindful of the doubt that will be expressed by many readers. Nevertheless, in spite of the extra labor and the expense of increased flash equipment, this method will succeed in making sound castings at less cost than any other known method. It will be noted that no mention is made as to the use of risers as part of any of the three proposed methods, as that is left to the individual tastes. A closer study of the bottom pouring system, as shown in Fig. 8, would indicate that risers taken off each casting would insure better work.

Another objection that may make some foundrymen hesitate before adopting this method is the extra labor entailed in separating the castings from the gates. A little study discloses the simple solution, which is to first cut through the runners, lay the castings on their sides, and cut through the gates. This method applies to nonferrous castings, in most cases when grey iron is used the castings can be knocked off.

It is but fair to state than snap molds cannot be expected to give results comparable with those of tight flask molds. The binding qualities of stiff metal flasks permit the placing of more patterns on a plate with a greater factor of pressure resisting safety, than would be possible with snap molds even when pouring jackets are used.

Core-Sand Mixture

I need some information on a good core mixture for use on compression bibbs, basin and bath cocks, also small valves. I am having trouble with some of the seats of the bibbs which blow at that point. My losses are about five per cent on bibbs and basin cocks. What I desire is a core sand mixture that would eliminate the blow holes and still leave the interior of the castings smooth.

A.—The trouble you are having is getting the vent away from such small and intricate shaped cores with such a thin cover of metal. It is a hard proposition to vent such cores properly, and unless the texture of the core itself is such that the gas escapes at once, there is apt to be trouble. Pure silica sand mixed with a good oil binder in the proportion of one of oil to forty or fifty of sand will give you good results.

The cores should be put into perfect fitting driers which will eliminate unnecessary wires and venting. The sand does not need to be sharp sand as the shape of the grain is not particular. As a matter of fact a grain without sharp corners will make a more open core and the oil will hold it securely. If pure silica sand is not to be found the only thing is to get as near as possible to it. The success of a core for any kind of work is having it hard enough to resist the hot metal and open enough to allow the gas to escape. Pure linseed oil and sharp sand will accomplish this on any kind of a casting, light or heavy, and for the work you are having trouble with it should relieve you.—P. W. BLAIR.

Brass Forgings

By C. G. HEIBY, Port Huron, Mich.*

To some persons the production of brass forgings may seem like a subject out of place for discussion by foundrymen, as it is not altogether a foundry proposition. It has been proved by experience that the manipulation of the metal by mechanical means outside the foundry adds greatly to its physical qualities. However, it is recognized that the brass foundry has a joint interest in the subject; it is responsible for the alloy used, which is important. The reason for presenting this subject is that foundrymen will be interested in a comparison in the quality of castings and forgings.

As far as is known by the writer, no record is available to show when brass forgings were first produced. Older text books on engineering materials generally state that brass can be cast and rolled, but can be forged only with difficulty or not at all. It is generally known, however, that the process was greatly developed on this continent during the late war, and was a reliable means of meeting the rigid specifications covering small brass parts for munitions. Since the close of the war much progress has been made in the application of this process in the production of standard commercial parts.

HOW FORGINGS ARE PRODUCED

Brass forgings are produced by squeezing or extruding a heated billet between closed or partly closed dies operated by presses of varying construction, according to the design of the piece being produced. It is possible to forge some simple parts in ordinary single acting crank presses, while other parts require double-acting presses with closed dies. In some designs hydraulic presses are advisable.

As the gating and pouring of each new casting is a problem in itself to the foundryman, so the production of each brass forging must be considered separately. After considerable experience it is found that they can be classified and the rules applying to the class to which the forging belongs can be applied.

The best way to secure a blank or billet for a brass forging is to cut them from extruded rods as it is most desirable to use a scalped blank, and it should be as free from defects caused by oxides, etc., as possible.

It will be noted, therefore, that except for the fact that brass forgings are in many instances taking the place of sand castings, the foundryman is not interested beyond the production of the billet for the ordinary brass rod extrusion press.

TRIED SAND CAST BLANKS

In the early stages of development in the brass forging industry, it was thought that ordinary sand castings could be successfully squeezed in closed dies and made to meet the same physical requirements as truly forged brass.

In every case this experiment proved a failure, as did also the attempt to use sand cast blanks for the same form as extruded blanks, and the failure was principally due to oxides forming between the crystals in the casting. No amount of squeezing under pressure would cause the oxidized crystals to weld together. Since test bars taken from squeezed and sand castings failed to meet the requirements, this procedure had to be abandoned.

It was also found impractical to partially forge a piece in the finished forging die, with the intention of reheating the blank and striking a second time to complete the forging. Partial forging in the finished die reveals the fact that brass when flowing in the die, opens up like a sponge, and if the partially forged piece in that condition is exposed to the air, or reheated, an oxide forms which prevents re-uniting the crystals by further manipulation.

On this account it has been found most practicable and economical on some shapes to extrude a bar of proper cross section from which the forging blank is cut.

Good brass forgings have been made in two forging operations by using two sets of dies. That is a breaking down die and a finishing die, but in every case it is necessary to entirely fill the die, and squeeze the metal sufficiently to eliminate porosity and thus prevent the forming of oxides. It is, of course, necessary to trim the flash and all surplus metal from the partially forged piece before heating for the second operation.

It is advisable wherever possible to forge brass in one operation as this practice not only reduces the salvage metal to the minimum, but also insures a more uniformly reliable structure.

USED CHILL CAST BLANKS IN WAR

A great many good brass forgings were made during the war from chill cast blanks. These blanks, usually in the form of round flat disks, are poured in open cast iron chills, pouring each cavity in the chill separately. The top and bottom sides of the blank are then machined to remove scale and oxides. The scale from the periphery of these blanks was not removed, and this frequently resulted in flaws in the forgings. If the test bar was taken from one of these forgings, its failure was almost a certainty, with the resultant rejection of the whole series covering a large quantity of perfectly good forgings, together with some questionable ones. This experience proves without question the desirability of the extruded blank.

Numerous experiments and actual proctice prove that standard brass forgings properly made of inexpensive alloy, are 80 per cent stronger than sand castings of a more expensive alloy.

The use of brass forgings is limited, but not to such an extent as upon slight consideration might be supposed. Their use is most desirable when a nonferrous part is wanted and when greater strength and greater uniformity in strength and form is needed than can be secured in the ordinary run of brass sand castings.

There is also a large and important field for their use wherever great density of structure is desired, or where the possibility of porosity is present, such as is the case with sand castings. Practical examples in this field are high pressure gas valves for use on steel bottles containing oxygen, carbonic acid gas, and other gases which are stored under high pressure. No one has been able to make sand castings sufficiently dense to hold these gases and it has become standard practice to make them of brass forgings.

Forged brass gasoline pipe connections for automobiles such as elbows, tees and oil pump bodies are also examples in this line. Their great density and uniformity eliminate the piece by piece inspection and pressure test which is necessary with sand castings, also the possibility of gasoline or oil seepage and the greasy surface which gathers dust and dirt and is altogether objectionable.

Forged brass pump valve seats are meeting with great favor because of their density and consequently longer life. They can be made lighter and stronger and have a large waterway, eliminating friction, thereby making a pump using forged brass valve seats more efficient.

*A paper read at the Columbus Convention of the A. F. A. June 6, 1922. Cuts were not obtained in time for publication.

Due to the greatly improved physical qualities and uniformity of form of brass forgings it is often possible to lighten parts appreciably and still retain a higher factor of safety. This feature alone is of great importance in the construction of all apparatus where it is desired to have great uniform strength with minimum weight, such as automotive vehicles, aircraft, etc., and can be compared with the use of special alloy steels for the same reason.

During the war millions of time fuse parts were made by this process and thousands of test bars pulled, prove without question, the uniformity of strength and structure.

Brass forgings came from the dies uniform in dimensions and they are clean and free from sand. On this account, they are preferred because they can be chucked true for machining, and because they are, in spite of their great density, easy on the cutting tools. Thus they can be machined uniformly accurate, each piece being of exactly the same structure.

Brass forgings made in properly designed dies, in presses of proper capacity and of uniform alloy, can be held to dimensions varying only .005 of an inch on diameters and .010 on lengths. This feature is considered of great importance by production engineers from the standpoint of efficiency in machining.

Due to the finished quality of the surface as they come from the die it is often possible to eliminate machine finishing operations entirely, and on polished parts a buffing operation is often all that is required.

For illustration, finished forged brass hexagon nuts do not require milling on the flats. The hole is forged the right size for tapping and is exactly in the center, making it unnecessary to use a drill before tapping. This reduces the chip salvage to the minimum.

An idea of the range of commercial work which has been successfully handled by one brass forging company is given in Figs. 1 and 2, which show respectively, a collection of finished parts made from forgings, and a group of finished parts together with the untrimmed forgings, and the blanks from which these pieces are produced.

COMPOSITION OF METAL

Unlike sand castings, which allow the use of an unlimited number of mixtures of brass and bronze, the process of hot forgings allows the use of a comparatively small number of mixtures. This is due to the fact that there are comparatively few brass and bronze mixtures which can be worked hot under pressure in a confined area, without splitting due to a cause known as "hot short."

In all forging mixtures, copper appears to be the governing element. The forging mixtures may be divided into two main classes—mixtures low in copper and those high in copper.

The mixtures low in copper comprise the largest percentage of forging mixtures used on a commercial basis. The composition of this mixture is as follows: Copper, 56 to 63; lead, 0 to 3; tin, 0 to 3; iron, 0 to 3 per cent; and the balance, zinc.

Mixtures containing less than 56 per cent copper are brittle, and hence are not used. Mixtures containing above 63 per cent copper are hard on the dies, causing them to crack. A mixture of this copper content also shows cracks in the forging, due to its "hot shortness" which seems to develop at about this point.

Mixtures containing from 63 to 86 per cent copper do not appear to lend themselves to the hot forging process in an enclosed area, such as a forging die.

To the mixture of the second class belong compositions containing from 87 per cent to 100 per cent copper. To this class belong the compositions known as the aluminum bronzes and pure copper.

PHYSICAL PROPERTIES

The physical properties of a forging depend principally on the composition and the "amount of work" performed on the metal during the forging operation. It is natural to expect higher physical properties from mixtures containing small amounts of hardeners such as tin, iron, manganese, etc., than from mixtures that are entirely free from these elements.

By the term "amount of work performed" is meant, the amount of flow or movement that has taken place in the metal during the forging operation. Forgings in which the amount of metal movement that has taken place is great show better physical qualities than do those in which the metal movement is small, because of the finer crystal structure produced during the operation.

The physical properties of a free cutting mixture containing 58 to 60 per cent copper, 1.5 to 2.5 per cent lead, and 37.5 to 40.5 per cent zinc are as follows: Yield point, 28,000 to 35,000; tensile strength, 55,000 to 65,000; elongation, 25 to 40 per cent; and Brinell hardness (10 millimeter ball),—80. The physical properties of forged aluminum bronze containing from 86 to 90 per cent copper, 1 to 2 per cent iron, and balance aluminum are as follows: Yield point, 75,000; tensile strength, 104,000; elongation, 15 per cent; and Brinell (10 mm. ball), 190.

MICROSTRUCTURE OF FORGINGS

In examining the microstructure of a sand casting, it is seen that the structure is coarse and open grained in character, and that the lines of division of the crystals are pronounced. In examining the microstructure of the forging, it is seen that the structure is fine grained, compact and uniform, and that the lines of division of crystals are absent. It is the working of the metal under a pressure of 200 tons per square inch, which produces this close-grained, homogeneous crystal structure, imparting to the forging its exceptional physical qualities.

A forged bar showed a tensile strength of 60,000 pounds per square inch with an elongation of 40 per cent in two inches. A cast bar showed a tensile strength of 34,000 pounds with an elongation of 14 per cent.

In the preparation of this paper the writer is indebted to F. M. Levy, metallurgist of the Mueller Metals Company for the laboratory information given.

Hardening High Speed Tools

Q.—Can you suggest the best methods and appliances for the hardening of high speed steel tools used on brass. They are mostly formed cutters and we are having trouble with blistering rough surfaces and cracks.

A.—Hardening high speed steel is usually carried out in a gas or electric furnace and the steel quenched in oil free from water until the oil ceases to flash on the surface of the piece. Pieces with fine cutting edges are brought to a quenching temperature by immersing in white-hot lead (after the necessary preliminary heating to a color) or in a bath of barium chloride kept at a proper temperature (from 2275° to 2325° F.). A little potassium ferrocyanide added to the bath will prevent decarburization of cutting edges while heating.

Tools should be ground with light pressure on a wet stone to avoid cracks due to sudden expansion of the surface caused by the heat of grinding. The high heats necessary for the successful hardening of high speed steels have a tendency to deteriorate slightly the outer portion of the metal. Grinding should be done on a free-cutting emery wheel under a copious steady flow of water. An intermittent flow of water allowing the tool to heat up after which it would again come in contact with water will cause surface cracks.—P. W. Blair.

American Electro-Platers' Society Convention

A Description of the Plating Industry of Cincinnati, Ohio, the Convention City, and Advance Information About the Convention

Written for The Metal Industry by H. N. LOEB, Cincinnati, O.

In THE METAL INDUSTRY for January, 1909, page 42, was published a letter from Charles H. Proctor, appealing for the formation of a national society of electroplaters. The response to this appeal was immediate. A committee was formed with Mr. Proctor as chairman and Percy S. Brown as secretary. Meetings were held and the preliminary work started.

On March 19, 1909, at the Astor House, New York, another meeting was held and a part of the constitution adopted. At the third meeting, on April 10, at the Hotel Chelsea, the entire constitution was adopted, and the National Electroplaters' Society was formally launched.

Since then, from a group of less than 60 charter members, this society now called the American Electroplaters' Society has grown to 24 branches and almost 1,000 members. Nine conventions have been held, this year's being the 10th.

It will be interesting to note from the following list that these conventions have been held in most of the important manufacturing centers.

1913.—New York, N. Y.
1914.—Chicago, Ill.
1915.—Dayton, Ohio.
1916.—Cleveland, Ohio.
1917.—St. Louis, Mo.
1918.—Detroit, Mich.
1919.—Philadelphia, Pa.
1920.—Rochester, N. Y.
1921.—Indianapolis, Ind.
1922.—Cincinnati, Ohio.

When electro-platers and members of allied interests foregather in Cincinnati on June 28-July 1 for the Ninth Annual Convention of the American Electro-Platers' Society, it is confidently expected that the Queen City of the West will witness the largest turnout in the history of the organization. This, not because Cincinnati has the largest number or the biggest plants in the country, but because of the diversity of the electro-plating industry in that city.

All the local committees for months have bent their efforts not only to arrange an instructive and entertaining time for their guests, but also to make the event so attractive that the largest number possible will attend. To this end, a program of capable speakers has been liberally punctured with sight-seeing in the picturesque old city, and virtually all shops of importance will throw wide their doors to A. E. S. members from other towns.

The history of electro-plating in Cincinnati goes back some sixty years. At that time the craft was veiled in deepest secrecy. There then were a few electro-plating shops—catering mostly to the individual with some little plating job—and from these the owner would receive his shining treasure, greatly mystified.

Gradually with advances in electricity and chemistry the trade expanded, until today the quality of Cincinnati work takes rank with any in the country. The thirty-nine members of the local branch of the A. E. S. are all keen students, holding frequent meetings to discuss and share their problems.

Among the pioneers in plating in Cincinnati were A. E. Kinsey, and Miller's Plating Works at Sixth and Elm streets. Both names are still remembered by old-timers

HOTEL GIBSON, CINCINNATI, O.

everywhere, though both firms have long since closed their doors.

W. J. Husing, secretary of the local Chapter, himself is no "spring chicken." He was in the business 42 years ago, when the platers went over from batteries to generators for current. Mr. Husing has charge of the extensive plating department of the Crane & Breed Manufacturing Company, one of the largest, if not the largest company making funeral supplies of every kind in the United States. At the Crane and Breed plant the convention delegates will see a number of polishing machines of exclusive design and a highly interesting traveling chain to carry the pieces through the various baths at variable speeds. These machines were the invention of Mr. Husing and his associates, quite a number of whom have been with this one company for more than two score years. At the Crane and Breed Company and also at the Cincinnati Coffin Company's establishment (another large firm in the same business) some unique effects in oxidized and special color plating are obtained.

The Lunkenheimer Brass Company in Fairmount, a suburb, is known throughout the country for its valves for every purpose, and not the least noteworthy feature of these products is the finish.

The Corcoran-Victor Company operates two great plants for plating the numerous automobile accessories which they produce. This firm should not be confused with the Corcoran Lamp Company, another well-known Cincinnati organization specializing on automobile headlights, and also maintaining an extensive electro-plating department where the visitors will be welcome.

The Dalton Adding Machine Company in Norwood, a city completely surrounded by the city of Cincinnati, does extensive nickel plating, as does also the Globe-

Wernicke Company, makers of the famous sectional book cases.

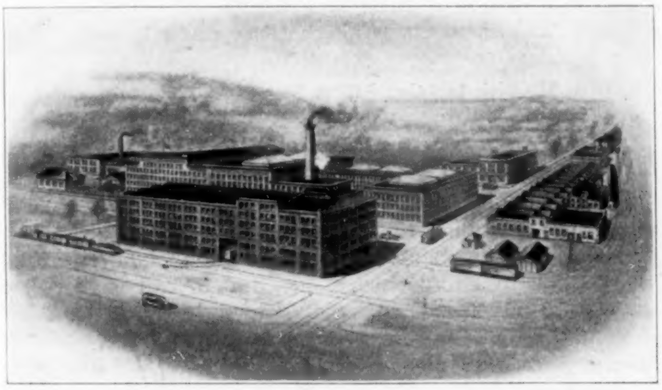
The Miller Stove & Range Company, the John Van Range Company, the Monitor Stove Company and other Cincinnati stove foundries also have modern and interesting plating departments. The Miller Plating Works, an institution distinct from the stove company of the same name, specializes in repair work, in which it does an extensive business.

The Gustav Fox Jewelry Company, jewelry manufacturers, are perhaps among the largest plating jewelers in the country, a healthy portion of their business consisting in the manufacture of fine badges, emblems and the like.

The Cincinnati Manufacturing Company, fly screen makers, will be an interesting source of information to those delegates interested in zinc plating. This is a representative firm in the fly screen field, and its plating shop is noteworthy.

If readers will observe the barber chairs in their home towns, the chances are they'll find these came from Berninghaus, Cincinnati. The Eugene Berninghaus Company, makers of Barber chairs and furniture, naturally must maintain an extensive plating shop, and here, as elsewhere, the latch-string will be out.

The Wadsworth Watch Case Company is directly opposite Cincinnati in Dayton, Kentucky. Visitors can reach the plant by crossing the famous Suspension Bridge over the Ohio River, itself a pleasurable experience. The company is one of Dayton's most important institutions, turning out hundreds of watch cases daily. The quality of their work can be seen in any jewelry store, but to witness the actual plating process, one must attend this convention.



THE LUNKENHEIMER COMPANY, CINCINNATI, O.

Without doubt the visitors will be interested in the Hauser-Stander Tank Company, not only because Stephen C. Hauser is on the program for an address on the effects of chemicals on various kinds of wood, but also because this firm has worked out such a splendid wooden tank for plating purposes, after having been dealt, according to a local newspaper, "a body blow by circumstances." This newspaper, which recently thought the plant of sufficient public interest for a write-up, said in part:

"Before the advent of prohibition, practically the entire output of this company went to brewers and distillers. Prohibition cut the demand short, and the company was faced with the necessity either of rebuilding its trade or going out of business. . . . In the march of progress the company worked out a tank that is a boon to galvanizers and others who use large quantities of acid. One of the progressive steps is a wooden tank lined with rubber."

Among other Cincinnati manufacturing platers may be mentioned the Q. C. Silver Plate Company, the Homan Manufacturing Company, the Enterprise Brass and Plating Company and the U. S. Bung Company—the latter in Norwood.

Quite a bit of work is given to the jobbing platers of Cincinnati by the local automobile plants. While no great number of passenger automobiles is made in the city—the Sayers Six being virtually the only one—there are a considerable number of trucks and fire engines made locally, that do not maintain their own plating departments. The jobbing platers thrive accordingly.

Among the more prominent of these will be found the C. & R. Plating Works, the National Brass Manufacturing Company, the Chipman Plating Works, the Creutz Plating Works, the Enghauser Plating Works, the O. K. Plating Works, the Popular Plating Works, the Practical Metal Goods Manufacturing Company and the Practical Plating Works. At the jobbers', as at the manufacturers', the visiting platers are cordially welcome, and will doubtless be surprised at the extensive equipment of some of these shops.

Cincinnati, because of its central location and the quality of its work also enjoys a considerable plating trade from other cities. Some visitors may wish to go to one of the adjacent towns before returning home. To these, Hamilton, Ohio, 25 miles distant, site of the Estate Stove Company and other industries and Dayton, Ohio, 60 miles away, of National Cash Register fame, extend their invitations.

Cincinnati has two principal railroad terminals, the Pennsylvania Lines, at Pearl and Butler streets, and the Central Union Station, at which virtually all other trains enter, at Fourth street and Central avenue. Street cars from both of these pass the Hotel Gibson, the convention headquarters.

Members of the local reception committee will be in the lobby of the hotel early on the opening day of the convention, and they will be prepared to direct the visitors to suitable accommodations. Besides the capacious Gibson, which is completing its great new addition, there are an ample number of first-class hotels within easy walking distance, whose rates are from $2.50 a day, depending upon the class of accommodation desired.

The local committees request that delegates report at the registration booth as soon as they arrive in the city, so that they may be assigned to their hotel, given their badges, etc.

The convention program follows:

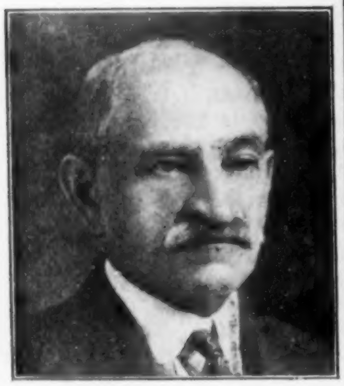
WEDNESDAY, JUNE 28

9:00 A. M. Arrival, reception and registration of delegates and visitors. Hotel Gibson, Fourth and Vine streets, ballroom floor.

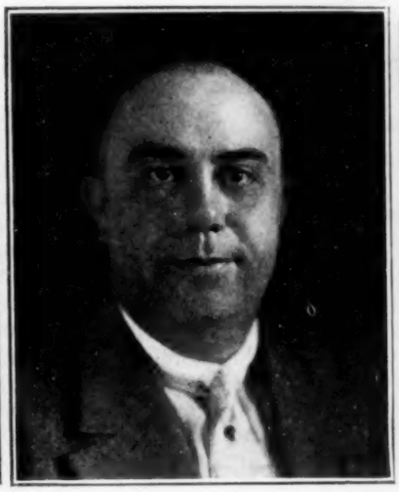
10:00 A. M. Convention called to order by Frank H. Nordman, President, Cincinnati Chapter, A. E. S.
Opening address by Mayor George P. Carel.
Acceptance by National President Philip Uhl of Philadelphia, Pa.
Address by Charles W. Proctor, New York, N. Y.
Address by Sylvester P. Gartland, Rochester, N. Y.
Address by Walter J. Allen, Grand Rapids, Mich.

11:00 A. M. Address by Professor R. S. Tour, University of Cincinnati.

2:30 P. M. Business. Introduction of members.
Paper: "The Electrical Industry and the College" by W. W. Boone assistant Professor of Metallurgy, University of Cincinnati. (A description of how the co-operative engineering college of the University of Cincinnati functions, together with brief

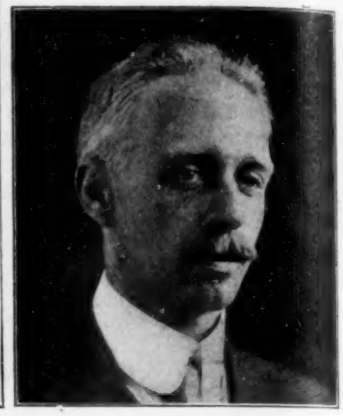


PHILIP UHL,
NATIONAL PRESIDENT



S. E. HEDDEN,
1ST VICE-PRESIDENT

F. J. HANLON,
2ND VICE-PRESIDENT



J. S. STERLING,
SECRETARY-TREASURER

reviews of recent electro-plating research conducted by senior metallurgical engineers.)

8:00 P. M. Paper: "Electro-Plating as Met by the Analytical Chemist" by F. C. Broeman, industrial chemist.

THURSDAY, JUNE 29

8:30 A. M. Business session.
9:30 A. M. Paper: "Nickel Plating," by Dr. W. Blum, Bureau of Standards, Washington, D. C.
12:00 M. Adjournment.
2:00 P. M. Paper: "Corrosion, Its Cause and Prevention," by W. G. Kopf, consulting engineer of McCormick Laboratories, Inc., Research Engineering Department of the Davis Sewing Machine Company, Dayton, Ohio. Paper illustrated with stereopticon slides.
3:30 P.M. Moving Pictures: "The Manufacture of Rust-Proof Iron," American Rolling Mills Company, Middletown, Ohio.
4:00 P. M. Paper: "Chemicals and Their Effect on Various Species of Wood," by Stephen C. Hauser, Hauser-Stander Tank Company, Cincinnati.
4:30 P. M. Paper: "The Udalyting Process," C. H. Humphries, Indianapolis, Ind.
6:30 P. M. Annual Banquet—Everything but Business!

FRIDAY, JUNE 30

9:00 A. M. Delegates board steamers, foot of Broadway, for Ohio River trip to Coney Island.
9:30 A. M. Business session on board.
11:00 A. M. Continuance of session at Island.
12:00 M. Luncheon at Clubhouse, Coney Island.
2:00 P. M. Ball game and entertainment by the General Committee.
4:30 P. M. Return to the hotel. Note: The Island may be reached by either boat or traction car.
8:00 P. M. Paper: "Experiments in Handling Fluoborate Solution," by W. M. Schumacher, graduate student, University of Cincinnati.
9:00 P. M. Paper by George K. Elliott, chief metallurgist, The Lunkenheimer Company.

SATURDAY, JULY 1

8:00 A. M. Election of Officers; Selection of 1923 Convention City; Installation of Officers. Closing.
2:00 P. M. Sight-seeing tour of Cincinnati plating shops and points of interest.

FOR THE LADIES

WEDNESDAY

9:00 A. M. Arrival, registration and reception at Hotel Gibson. Distribution of badges, etc.
10:00 A. M. Meet on mezzanine floor of hotel to renew acquaintances.
2:30 P. M. Shopping and visiting tour of Cincinnati stores.
8:00 P.M. Amusement park or theater party.

THURSDAY

2:00 P. M. Visit to Rookwood Pottery, Art Museum, Eden Park.
2:30 P. M. Visit to Zoological Gardens.
6:30 P.M. Annual Banquet, Hotel Gibson.

FRIDAY

9:00 A. M. Steamer to Coney Island.
10:30 A. M. Arrive at Island for all-day picnic.
4:30 P. M. Return to Hotel.
7:30 P. M. Visit to Chester Park (Amusement Resort).

SATURDAY

9:00 A. M Visit to Jabez Elliott Flower Market.
2:00 P. M. Sight-seeing automobile tour of Cincinnati parks.

The Buffers', Polishers' and Platers' Supply Association will hold its Annual Convention also in Cincinnati June 26 and 27. They may arrange to stay over for the A.E.S. meetings, beginning the following day.

New England members are working to hold the 1923 convention in Providence, R. I., and to call it the New England Convention. All are asked to help put this over.

Tinsel

Q.—We are enclosing several pieces of very fine wire, which look to the writer very much like Christmas Tree Tinsel.

Can you give us any information as to how the bright brass effect may be obtained on the unfinished wire, which has a copperish cast?

A.—The fine copper wire submitted to us as a sample is eventually converted to Christmas Tree Tinsel. It is rolled in the form of tinsel, like sample which you submit to us.

Briefly, the methods of production are as follows:

The copper wire is drawn to about 20 B. & S. Gauge. It is then enclosed in iron pots, in which is also put zinc dust, The iron pot is then hermetically sealed with fire clay, and placed in a muffle. The pots are heated to 700 degrees Fahr., at which temperature the zinc dust vaporizes and deposits in the metallic form on the copper wire.

After cooling, the copper is drawn by successive stages by the aid of diamond dies to the desired size. The drawing operations force the zinc into the copper, eventually forming a brass color, as noted on the tinsel.

The wire is spooled as it is drawn and eventually sent to the tinsel manufacturer to be rolled into tinsel.

The silver tinsel is a silver deposit upon copper wire, drawn down as outlined and finally rolled to a tinsel.

The rolls used are very highly burnished. The result is that the tinsel is equally burnished by the impact of rolling.—C. H. PROCTOR.

Japanning

A Description of the Methods by Which the Rule-of-Thumb Operations of an Old Art Were Changed to Standard Operations. Part 1.

Written for The Metal Industry by S. R. GERBER, Industrial Engineer*

Japanning is an old art, but not until the advent of the rapid growth of the automobile industry has it received scientific attention. Even then, japanning as applied to the automobile industry only was thoroughly investigated, while in plants manufacturing sewing machines, typewriters, and cream separators, the art was practised as it was handed down from father to son, from master to apprentice. Only rule-of-thumb methods were employed, additional operations being added from time to time to overcome each new difficulty that arose, instead of investigating the cause of the difficulty and possibly even eliminating some of the existing operations.

Good japanning demands a finely finished product,—a deep full color, and a smooth hard surface. The coat of japan, though hard, should not be brittle. One of the tests for a well baked japan is to cut into the surface with a pen-knife at an angle like taking a cut with a lathe tool. The "chip" of japan should curl off in the same manner as a chip of steel curls off the cylindrical body cut on a lathe. At the same time the japan should be hard enough so that the finger nail cannot dig into it.

The first essential in producing the required finish is to have a good foundation for the japan; that is, a smooth hard surface. If black japan is used, a dead black finish is required on the smooth surface before applying the finish coat or coats of japan. Of course, a smooth hard surface can be obtained by grinding the casting and then rubbing it with fine emery cloth. This process is obviously too expensive and tedious. Therefore the pores and the unevenness of the cast iron surface are filled with an iron filler which can be baked hard and yet can readily be rubbed smooth with emery cloth. When this is done properly and thoroughly the required foundation is produced. After this it is less difficult to finish the surface satisfactorily.

The writer has been fortunate in having the opportunity to make a thorough study and investigation of the intricate japanning process in several of the largest manufacturing plants in the United States. In this article he will describe the rule-of-thumb methods employed in one of these plants before the investigation was made and the standard formulae and methods adopted and now in use as a result of the investigation.

To present the various processes let us take up the japanning of a cast iron frame such as is used in the construction of a cream separator.

The following is an outline of the general process:

1. Priming.
2. Puttying.
3. Sanding.
4. Japanning.
5. Decorating and Striping.
6. Bronzing.

PRIMING

As the castings arrived from the foundry with a considerable coating of sand and other impurities, they were dipped in the prime solution to "wash off the dirt," and because priming was always done and therefore should be done. After they were removed from this bath they were sometimes baked and sometimes left to dry in the air if the ovens were filled to capacity. The solution, naturally, became dirty and muddy in time. Also, due to the evaporation of the turpentine or pentine, it became too heavy, and therefore had to be thinned. Consequently, not only was the fundamental value of the prime coat lost, but actual detriment was created since the castings came out quite dirty and caused difficulties in the subsequent operations.

The prime coat on the castings has two purposes; the first, to protect the inner and other unfinished surfaces from oxidization, and the other, to assist in the adhesion of the filler to the iron. The sand and dirt on the castings should be removed by some other means. The method finally adopted was to blow off the sand by compressed air and wipe off the dust with a rag. The frame was then dipped into the prime solution. It was necessary to insure a solution of uniform density and thereby avoid the danger of having a prime coat either too thin or too heavy. A too thin coat would be practically useless, and a too heavy coat would run in sags and mar the appearance of the work, even after the final finish coat was applied. A uniform prime solution was insured by checking the density of the prime solution twice daily with a hydrometer and making necessary adjustments either by adding more pentine or more japan. A mixture of first coat japan and pentine, about half and half, makes a satisfactory priming bath.

It is always necessary to bake the prime coat rather than to depend haphazardly on whether the capacity of the ovens will allow it. If the prime coat is not baked, it will be absorbed by the filler which is next put on the casting, and thus destroy the adhesive agent of the prime film and also thin the filler, thereby rendering it less effective. These changes, having been definitely established and fixed in the priming process, we proceeded to investigate the filling, or as it was called, puttying operations.

PUTTYING

The object of the puttying operation, as it was mentioned above, is to produce a surface which can more readily be made smooth than the iron proper. To produce a coat of putty heavy enough for the purpose it was necessary to have three puttying operations. Each coat had to be baked before applying the next. If one thick layer were applied, it would crack in the baking. Though each layer of putty was pressed and smoothed out with a putty knife, yet they followed the irregularities in the iron. The cross-section sketch illustrates, on an enlarged scale, the nature of the layer of putty.

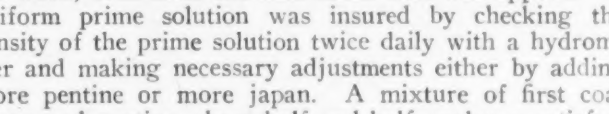


FIG. 1. HOW PUTTY LIES ON CASTING

From the sketch it can be seen that the "valleys" in the putty must be as high, or higher, than the "hills" of the iron in order to make possible a smooth surface of putty after rubbing down.

A thorough and extensive study of this operation was made in order to eliminate, if possible, the subsequent or,

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as it was called, rubbing or sanding operation, and also to reduce the time and skill required in the puttying operation. Methods other than applying the putty with a putty knife were tried, such as spraying thin puttty on the casting, spraying and padding the putty smooth with a canvas pad, applying the putty with a putty knife, then padding it, patching the roughest parts of the surface with putty, then spraying and padding. In every case the results were unsatisfactory. And it was expected that it should be so, because the layers of putty, no matter how applied, inevitably followed the waves and unevenness of the surfaces of casting. Consequently the old method of applying the putty with a putty knife was established as the most efficient and effective.

However, the manner in which the putty was maintained at the desired thickness by the operators was far from satisfactory. Each puttier had at his work table a pot of putty and a can of pentine. When he thought that the putty had become too thick, he put more pentine into it and when it had become too thin, he put more heavy putty into it. This caused considerable variation in the subsequent operations and also in the quality of the finished product. If the putty used was too hard then the sanding operation was made more difficult and if the putty was too thin or too soft, then it not only rubbed off too easily, thus leaving holes, but it also absorbed the japan, thus making the finished surface flat, i.e., not of a full deep color.

The putty was made of a mixture of Pennsylvania filler and first-coat japan, thinned with pentine. To determine the correct composition of the putty various consistencies were tried, as shown in the following table:

	JAPAN	PENNA. FILLER	PENTINE
I	1 lb.	1¾ lbs.	⅜ oz.
II	1 "	2 "	¾ "
III	1 "	2¼ "	1½ "
IV	1 "	2½ "	2¾ "
V	1 "	2¾ "	3 "
VI	1 "	3 "	3¾ "
VII	1 "	2½ "	5 "
VIII	1 "	4 "	6 "

With formula VI the best results were obtained in sanding or rubbing. To ascertain whether the binder used in this mixture was strong enough, formula VII and VIII were tried. Formula VII worked as well as VI but VIII proved undesirable. That is, when the putty was mixed as in formula VIII, it rubbed off too freely after baking, leaving pores in the surface. To play safe, then, formula VI was adopted as a standard mixture. To maintain this condition at the work bench and avoid tampering with the putty by the workman, all pentine and heavy putty was taken from the puttier, and at certain intervals during the day he would return his pot of putty to the stock room and receive a pot of fresh putty.

The putty was mixed in large quantities by the man in charge of the stock room and there it was kept at constant density.

One of the reasons that led the puttier to thin his putty was that it made it easier to apply and therefore enabled him to turn out more work on piece-work. Yet it had to be stopped because of the detrimental effects on the subsequent operations and on the final results.

When the proper density of putty was finally established and adopted, it was possible to obtain satisfactory quality with two coats of putty, baking at a temperature of about 350° F. after each coat.

SANDING

The sanding or rubbing operation presented a difficult problem. It was hard labor done by poorly paid men. It is a class of work that requires both brain and brawn and therefore necessitates careful selection of labor. Merely rubbing the puttied surface with emery cloth, without using judgment, without closely observing where most rubbing is needed, not only produced far from the required finish, but also took too much time. On account of the undesirable features of this work and the low pay, due to the fact that the management had not recognized the necessity of employing higher class men for this work, the labor turnover was extremely high and there were always green men on the job.

There were two things to be done with this operation; to select the best man and teach him how to do the work with the least effort and yet produce good quality; or, attempt to do the job some other way. Both were tried. First, a series of experiments were undertaken to determine whether the surface of the putty can be brought to the required smoothness other than by sanding, or, by reducing the amount of sanding.

On some castings only the corners were rubbed smooth because they seemed to be the roughest there; on others only the marks left by the putty knife were removed and an apparently smooth surface was obtained, yet when the final coats of japan were applied and baked, the wavy surface of the castings showed up clearly. Then, on the assumption that emery cloth was not the proper material to work with, other materials were tried. Pumice stone in lumps, was tried; but since the surface of the casting is not level, the pumice brick touched only the high spots. Both wet and dry powdered pumice proved unsatisfactory for the purpose, similarly steel wool dipped in wet powdered emery; or sand blasting, which merely wore the filler off the casting and naturally did not improve the surface.

There seemed no way of escaping the cold fact that the surface of the putty remained as wavy as the surface of the iron. Also, that to produce such a foundation for the japan as will make it possible to reflect a deep, full, black color, the putty had to be rubbed down flat. It is also necessary that the lines in the putty caused by grains of emery during the sanding operation, should be not too deep and **all in the same direction.**

JAPANNING

The casting well prepared with a good base for the japan, there still remains the problem of finishing the work to give the desired result. The japanning must be done in a clean room, at fairly constant temperature, and the japan must be skillfully applied and properly baked. When the investigation was begun in this department, conditions were not conducive to high quality production; consequently, there were a number of avoidable operations done, about 30% of the castings had to be reworked, and the product finally passed was far below the desired standard.

It started with brushing on a first coat of japan. This, being a "first coat," was done carelessly, with dirty worn-out brushes and dirty japan. Here, too, as in the puttying department, the japan was thinned or made heavier at the workman's discretion or his desire to turn out more work. Carelessness and slovenliness in this operation necessitated the establishment of another sanding operation. After the first coat was baked, the frames were rubbed down with coarse emery cloth to remove the hair and dirt left by the first coat. This sanding operation was performed so carelessly that another flat coat became necessary. So the second coat of japan was applied, but with somewhat more care and cleanliness. When this second coat was baked, a third and finish coat was applied. After the third coat was baked, the finished frame was inspected and a large percentage rejected for poor finish.

The first step towards relieving the situation was to standardize the japan and brushes used. All japan and

pentine was removed from the room and placed in the stock room in charge of one man, whose duty it was to mix the japan to the require density and keep the brushes in proper condition. A special pot was made for the japan so that it could always be kept covered, even when in use. The workmen were given their pot of japan every morning and when they found it was getting too thick, they returned it to the stock room and received a pot of fresh japan In this manner, the japan used was always at the proper density. Thus were overcome the variations in finish due to too thin or too thick japan. The pots were cleaned whenever they were returned to the stock room, thus eliminating the greatest cause of dirty work. These changes alone aided greatly in reducing the percentage of reworks.

After these preliminary changes were made, the investigators turned their attention towards changing the method of applying the japan. It was argued that on account of the peculiar shape of the frames it was impossible to apply the japan in any other way but brushing. Dipping was out of the question because the inner surfaces of the frame were machined. Flow-coating was tried but left too many drip points. Spraying was tried and proved, at first, unsuccessful because of the odd-shaped surfaces and the difficulty of avoiding sags.

SPRAYING

After long and tedious experimentation with various types of air-brushes and various density japans and methods of holding the frame, the writer finally succeeded in producing a perfectly satisfactory finish on the frames by spraying two coats—a flat coat and a finish coat.

The frame was set on a turn table which was turned by hand as the spraying progressed. Considerable practise was required to manipulate the air-brush skillfully. The best brusher was selected and in short time was taught the art of spraying with astonishing results. One sprayer produced as much work per day as five brush hands, achieving, at the same time, incomparable quality. There were no brush marks, no hairs, no dirt,—just a clean, perfect job. To obtain the best results, the following instructions were given the sprayer.

The spray should never be started on the work, but must be shot into the air first. This is necessary for two reasons. First, a clot of japan which shoots off when the spray is started, may have formed on the nozzle and should, of course, be kept off the work. Second, the man, in starting the spray, hesitates slightly before he starts moving the aeron. During this hesitation he will allow too much japan to collect in one spot and cause a sag.

The spray should be moved in such a direction as to travel the longest distance the work will allow. This reduces the number of times the spray will shoot into the air and thus saves japan. When the man reaches the end of his stroke he should not begin to go back until the spray has left the surface of the work. Should he end the stroke while the spray is still on the work, the length of time he stops before changing his direction will allow too much japan on that spot and cause a sag. One of the most difficult things for the new sprayer to learn is how fast the spray may be passed over the work and yet produce the desired finish. The speed at which the spray may travel over the work depends, to a great extent, on the volume of the spray. But the sprayer can tell, while spraying, from the appearance of the surface being japanned, whether he is applying the maximum safe quantity of japan. The ideal condition is to apply the greatest quantity of japan without causing sags, and also to use as heavy a japan as possible to pass freely through the nozzle of the aeron.

An electric heating device attached to the nozzle heats the air used in sprays and serves both to thin the japan and maintain it at a constant temperature. In this way the density of the japan is kept independent of the temperature of the room. This allows the use of denser japan, that is, japan with less pentine. The pentine is a necessary evil. It detracts from the quality and fullness of the finished product yet it is necessary to thin the japan in order to make it applicable. But the use of the electric heater eliminates a considerable quantity of pentine. Previous to the adoption of the electric heater, the quality of the work turned out depended somewhat on the weather. On a cold day more pentine was used to thin the japan, giving a poorer finish, and on a hot day less pentine was used, resulting in a better finish, while with the electric heater the quality of the work was fairly uniform.

The sprayer can judge by the appearance of the work when he has applied the maximum amount of japan. When the spray first strikes the work it reflects a silvery haze. As the japan continues to fall on that spot it becomes darker and darker until, when the maximum quantity that can be held is reached, the surface looks black and wet. Should he continue to spray on that spot after it has reached that condition, it will begin to reflect the light like a mirror and in this condition it will sag when baking. Obviously, the speed with which the spray may be moved over the work depends on the density of the japan, the air pressure, and the size of the opening in the aeron. A green operator should work with a small spray to allow him time to judge as he passes along, when he has applied a sufficient quantity of japan on the work. As he becomes more expert, he may increase the size of the spray and work much more rapidly.

Two spray coats were sufficient to produce a high quality finish. When the spraying was established, all brushing was stopped. The sanding operation after the first brush coat, and the second brush coat, were eliminated. In short, the three brush coats and one sanding operation, which in all required seven men to produce the factory requirements, were replaced by two spray coats which were done by one sprayer and a helper.

(This article will be concluded in an early issue.—Ed.)

Removing Zinc from White Metals

Q.—Is there any other way than sweating type metals to free them from zinc. The drosses from linotype and monotype machines are super-heated in a common white metal kettle used for the purpose in a printing foundry. Getting as much of the metal from the dross as possible, I let it cool down and then I heat it again, skimming the oxide from the metal as soon as it is hot enough. I also use a pine stick to agitate the metal which helps considerable. Could you suggest any other method than the one I just mentioned?

A.—Throw on the top of the bath of molten metal, a few pieces of stick sulphur. You can judge whether the metal is at the proper temperature by the way this sulphur acts. If it is too hot, the sulphur will blaze white and make a hissing noise. The sulphur should burn with a blue flame and at a moderate rate. Puddle this sulphur into the bath so that all parts of the bath come in contact with it. This should be continued for about fifteen minutes at least. After this is finished, throw enough rosin, in lump or powdered form, on the bath to cover it. This will burn and give off a thick, black smoke. Puddle the rosin into the metal in the same way that the sulphur is handled, and continue until the top of the bath looks perfectly clean, except for a fine brownish black dust. This can be skimmed off and the bath used.—A. BREGMAN.

Sulphides as Bronzing Agents

Methods of Making Sulphides and Applying Them. A Few Tricks of the Trade. Part 1.

Written for The Metal Industry by ARAYEL

It not infrequently happens that platers located in the smaller cities find it not only desirable, but profitable, to be able to employ expedients; the need of which is often keenly felt in shops that endeavor to satisfy the demands of the transient trade in all their variability. Often the operator in such a shop finds himself in need of an ounce or two of some substance that can be procured locally, only at an exorbitant price, if at all, or by purchasing a large quantity at a great distance.

Sulphur: a pale yellow, brittle, solid body, melts at 232° F.; distils unaltered if air is excluded; insoluble in water and alcohol; soluble in oils, hot fats and very freely in solutions of caustic potash soda and in carbon-bisulphide. As a bronzing agent it is used in its combined state; the combinations used being those known as sulphides.

METHODS OF MAKING SULPHIDES

Sulphides can be formed by heating metals in contact with sulphur, by the action of sulphuretted hydrogen on metals, by the reduction of sulphates with hydrogen; coal, charcoal, or organic substances; by heating metallic oxides in contact with vapor of sulphuretted hydrogen or of carbon bisulphide, by precipitation from metallic solutions with sulphuretted hydrogen or solution of alkaline sulphide, and by subjecting metals to the action of sulphides in aqueous solution. The last reaction is made use of in applying sulphides as bronzing agents.

The sulphides most widely used for bronzing are the sulphides of sodium, potassium, ammonium, arsenic, antimony and barium; sulphide of ammonia is miscible with water. Sulphide of potash known also as liver of sulphur, sulphurate and sulphuret is soluble in water. Of the three metallic sulphides mentioned only one, the barium compound, is soluble in water. The other two are soluble in ammonium sulphide or in solution of caustic alkali (lye water). The sulphides soluble in water act most quickly on silver, copper and alloys rich in copper; the metallic sulphides are best applied to brass and light-colored bronze, and lastly they can be mixed in solution and used as double sulphides.

Liver of sulphur is of variable composition and can be formed by mixing thoroughly two parts by weight of dry carbonate of potash with one of sulphur flour and then melting them together, at a temperature below ignition, until all bubbles cease.

Sulphide of ammonia is formed when a stream of sulphuretted hydrogen gas is passed through liquid ammonia. Sulphuretted hydrogen can be had at a moment's notice in the following way: Have a large bottle or small jug supplied with a cork perforated to accommodate a rubber tube about one quarter inch diameter. Put some iron sulphide (pyrite) in the bottle and pour in a little clean water; when you want the gas pour in a few drops of sulphuric acid, put the cork in at once, at the same time having one end of the tube in the cork, the other end in the liquid to be saturated with the gas; the operation finished, pour off the water from the sulphide in the generator, put in fresh and your apparatus is ready for the next.

Barium sulphide can be made by heating to a high red heat, for at least an hour, a mixture of barium sulphate and powdered coal pressed in a covered crucible. When cold the ash is treated with water which dissolves out the sulphide. Barium sulphate is a heavy white powder used in paint and is also known as "barytes" and "blanc fixe."

It does not matter how you obtain your sulphides so long as you do not steal them; lead, tin, antimony, solder even a chunk of pewter or babbit melted to a good red heat and then poured into a larger ladle or crucible containing at least twice as much sulphur as metal used will produce the corresponding sulphide or mixed sulphides in a state of greater or less purity. With the means that were at my disposal I found this method better than introducing the sulphur into the molten metal. These mixtures dissolved in lye water make very effective bronzing solutions. Indeed, I preferred them to the purchased red or yellow sulphides of arsenic and antimony.

Aluminum sulphide has the peculiar property of being briskly decomposed by water with copious evolution of sulphuretted hydrogen. The best I could do with it by melting scrap in a ladle was to make a brittle, porous mass consisting largely of metal. However, by taking a paper of the bronzing powder and thoroughly mixing it with several times its bulk of sulphur and putting the mixture into a red hot ladle, I obtained it in a state of purity and in the shape of a glassy, grey enamel-like mass.

Mix your hot metal with the sulphur outside if you have no arrangement for carrying off the fumes.

Red rubber, besides its content of sulphur, is loaded with red sulphide of antimony. Take a piece of an old inner tube, cut it up and put it in a ladle with about as much sal soda or lye and put the ladle on the fire. First the soda will dissolve in its water of crystallization, and when it has dried up the rubber will melt and take fire; let it burn, and when the contents of the ladle look like a red-hot, half-molten mass, take it off and let it cool. You need no lye water for this mixture if it is dissolved at once.

A mixture of equal parts of sulphur, sal soda, lye or one of the cleaners used for cleaning metals and the same amount of coal dust or sawdust fused to a fully ignited and glowing mass and afterward dissolved in water will yield a bronzing solution. Sawdust or coal wet with sulphuric acid and mixed with as much sal soda and fused as above will act the same. But whatever you do never substitute nitric acid for sulphuric, or try to reduce a nitrate or a chlorate the same as you would a sulphate, for if you do your experiment, even on a small scale, instead of being a success, will be a dangerous explosion.

Hyposulphite of soda, either by itself or with some organic addition, when fused to thorough ignition, changes largely to sulphide and will act accordingly.

These crude sodium sulphides yield solutions that appear black from suspended carbon in a minute state of sub-division; filtering is unnecessary. They also contain quite a bit of iron sulphide from the ladle, which is attacked during fusion of the mix. They yield the colors produced by liver of sulfur on silver, copper, brass and bronze; indeed, the very impurities they contain seem rather to augment than to impair their action.

A can of lye from the grocer and a nickle's worth of sulphur from the druggist will work wonders in a pinch;

so will a couple ounces of lye and a box of matches in a dish pan of boiling water. I made a fixture pan a beautiful brown just that way and received a good price because the customer did not have to wait three weeks by sending it out of town. You see the heads of matches consist largely of metallic sulphides, and who knows but what the phosphorus and chlorate help a little too.

MULTITUDINOUS NAMES FOR FINISHES

Many a time a local fixture dealer would call up and say: "Can you change a brush brass fixture to etruscan gilt today?" The answer would be, "Yes, send along a sample." Then perhaps the next day another who had to lengthen a fixture would say, "Can you finish a piece of chain Byzantine today?" The answer would be, "Yes, send along a sample." Next one might want a canopy shell made Roman gold. Many times I have found identical finishes bearing different names. Sometimes the Romans would cut down their work with polishing wheels and buff, then bright dip it or again satin finish it with sand blast or steel brush. Sometimes the Byzantines would run out of umber and use sienna or forget themselves entirely and make a slaty green background with polished high lights or incline the whole thing to brown. Sometimes the Etrurians would color their work apparently with liver of sulphur or with lacquer loaded with color, and then again some Venetian would run amuck and label one or all Italian gold. Then not to be outdone some Pompeiian would create a brasso-chromatic wonder and earn undying fame. Did Moses invent mosaic gold and Adam give to Adam gilt his name?

METHODS OF OBTAINING VARIOUS FINISHES

I used to make nice gold colors on good yellow dip brass by adding two ounces of oxalic acid to a gallon of water, neutralizing it to an alkaline reaction with sal soda and then adding just enough home made alkaline sulphide to give the solution a faint yellow color, using the solution warm. A piece of brass immersed too long would become a dark green inclined to iridescence. I do not know what governing action the oxalate had. All I know is that it gave uniform colors free from the purple stains that often appear around pits and edges when making gold colors with liver of sulphur. It did not occur to me then but has since, that possibly any other cheaper acid or salt neutralized to an alkaline reaction might do the same if used in the same manner.

I have told in what media the sulphides used for bronzing are soluble, but no hard and fast rules can be made for producing shades of color because of the factors that influence their production. Inexperience is the factor that contributes most to failure. Bronzing or oxidizing solutions, as they are more commonly known, are like plating solutions in that the work to be bronzed must be as clean as for plating, and also that the color produced will be lustrous or dead according to whether the metal acted upon is matted or polished. Here the resemblance ceases; they are not as stable, and for that reason are made up only as required, and in sufficient quantity only to do the work in hand unless they can be returned to an air-tight container after use. Modern scientific platers have shown that the metallic content of plating solutions can be doubled and in some cases tripled over old existing formula and production correspondingly increased; but you cannot double the chemical content of a bronzing formula hoping thereby to double your output or make the solution last indefinitely, because light shades are difficult to produce in concentrated solutions. The browns and blacks, if produced in too strong a solution, will either flake off or the metal worked upon corrode through entirely as in the case of silver or copper electroplate. Some formulas for brown or brass are as follows:

1. Barium sulphide, 100 grains; water, one pint. Use hot.

2. Water, one gallon; strong ammonia, one pint; one half ounce yellow sulphide of antimony. Use warm.

Statuary bronze for copper and bronze. One gallon water, one ounce sulphate of ammonia, one ounce sulphide of barium. Use cold.

Liver of sulphur in amounts ranging from one-fourth to two ounces per gallon, is prescribed for producing shades of statuary up to black on copper and golden brown, green, grey to black on silver. One operator recommends the addition of ammonia; another, ammonium carbonate, ammonium bisulphide, sulphate or chloride.

These recipes with variations made by dilution, concentration, or combination, one with the other have been used for years; one man may use the barium formula, another the antimony and still another the liver of sulphur and all achieve identical results. They may then exchange formulas and be unable to produce identical results; a fourth man may be able to use any one of the three formulas and be successful or even combine them and produce shades the others had never thought possible; it is not in the formula but in the man.

(This article will be concluded in an early issue.—Ed.)

Stripping Silver

Q.—Will you kindly give us any information that you may have on the separation of silver from plated metal, such as knives, forks and spoons? Most of the silver is plated on the material, containing 60 of copper and 15 per cent nickel, and the balance zinc.

A.—The separation of silver from silver plated metal whose basic alloy is 15 per cent nickel, 60 per cent copper and 25 per cent zinc can be accomplished by either of the following methods:

First.—Dissolve the articles in nitric acid, 50 per cent; water, 50 per cent, until solution is complete. Then dilute the saturated solution of the nitrate of silver, copper and zinc to three or four times its volume. Then add common salt, which will precipitate the silver, the copper and the zinc remaining in solution. Filter the silver chloride precipitate from the solution, wash thoroughly and dry. The silver chloride can be converted to the metallic state by fusion, using equal parts of soda ash and borax as a flux in melting the silver chloride.

Second.—The silver may be also removed by electrolysis. This method would consist of a 10 to 15 per cent solution of nitric acid and water. The articles from which the silver is to be removed should be made the anodes, and should be held in wooden troughs perforated with holes. The positive current may be carried to the articles in the wood trough with carbon strips or rod. The negative factor may be of the same material. The silver will be reduced to the nitrate and the basic metal will not be acted upon providing the voltage be low, one-half to one volt. The silver can afterwards be recovered as outlined in method No. 1.

Third.—A solution of sodium cyanide could be also used in the same manner. A 15 to 20 per cent solution. The silver reduced would be held in suspension, or if zinc cathodes were used the silver would deposit upon the zinc cathodes but would not adhere to them, and would fall to the bottom of the tank as films of metallic silver.—C. H. PROCTOR.

National Jewelry Standards

A Plea for Nation-Wide Legal Standards for the Jewelry and Silverware Trades

Written for The Metal Industry by CHARLES H. PROCTOR, Plating-Chemical Editor

Any person who attended the first informal dinner of the National Jewelers' Board of Trade at the Hotel Astor, New York City, on the evening of May 24, could not fail to be impressed with the splendid representative gathering of men, whose names are pre-eminent in the jewelry and silver trades, men who have made names for themselves that are land-marks and milestones in our commercial history.

A few of the topics discussed were as follows:

The creation of standards; the guaranteeing of karat marks upon articles made of fine gold alloy; the creating of a national sterling silver standard mark, standardizing of deposits upon base metal alloys known as silver plate; standardizing methods to control combinations of white gold and platinum or green or yellow gold and platinum so that the purchaser may be assured of the value of either metal by the respective standard mark upon such articles; the elimination of trade names for basic metals or combination of precious metals and basic metals, which tend to deceive the public of their intrinsic value, whether such trade names are of ancient or modern creation; the prosecution of manufacturers or dealers who deceive by imprinting upon an article a false stamp or mark.

The work that the National Jewelers' Board of Trade has undertaken is a laudable one. THE METAL INDUSTRY for years has consistently dwelt upon standardized methods for all lines of industry and will continue this work.

In January, 1917, the writer introduced the subject to the trade in his article entitled, "Shall We Have Commercial Standards of Electro-Deposits and Government Marks of Karat Alloys?" In his opinion, what is most desired to protect the jewelry and silver and allied trades of this country is a national stamping law of one sort or another, so long as the law so created can be enforced. The present individual state laws are inadequate, and in many instances are a farce. Some state laws legalize stamping in their respective state, while in other states where no law exists covering the correct stamping of articles made from gold or silver, it creates an incentive to defraud and deceive the purchaser.

The solution of the problem then is a national stamping and marking law for all states and territories so that any infringement of the law will be equally liable in all states and territories even as counterfeiting is equally punishable wherever it may occur.

But before such a law can become operative what is most desired is a true conception of the things that the law shall cover and the education of the consuming public to understand such a law. This would mean national advertising of the standard marks, so that the public would be informed. All manufacturers would or should contribute to this fund for national advertising.

Some of the phrases that should be eliminated but are now in daily use are as follows:

The term **solid gold** as applied to articles made of a **fine gold** alloy. This is a misnomer. Twenty-four karat is solid gold. Any article made of an alloy of lower karat should be designated as 10 karat, 14, 18 or 22 karat gold. Yet we see articles even made of 8 karat, which is the lowest karat gold alloy that will stand the acid test, marked solid gold.

The term **Sterling** when applied to an article made of an alloy of fine silver should be stamped fine silver 925; any article of a lower percentage represented to be silver would be a fraud and punishable accordingly.

Silver plated ware should be covered by standard deposits like the well known grades of flatware, steel knives and forks, spoons, etc., such as Rogers 1847. All hollow ware or similar articles should be stamped with a special mark such as fine silver plate and the weight of silver deposited thereon given in pennyweights.

The term **Sheffield Plate,** which now covers a multitude of sins in the silver plating industry should be entirely eliminated. The old Sheffield silver plate manufactured in Sheffield, England, a century or more ago, and up to the advent of the electro-silver plating method in 1847, was not a silver plate as we now term articles silver-plated today.

Sheffield plate was made up of two sheets of fine silver soldered to a sheet of copper (the malleability of silver and copper being nearly equal). Such sheets could be rolled to any desired size, and frabricated. Such articles can be seen occasionally in the antique art shops, the edges of the article will denote the true Sheffield plate, because if lightly scraped the combination of silver and copper sheet will be noted.

Sheffield plate, then, is a misnomer when applied to silver-plated articles even though the base metal may be of copper. The term has been misused and abused, and as previously stated covers a multitude of sins. Educate the public to this deception and eliminate it from the trade.

Other factors which are misleading are the nickel alloys, which for years have been connected with the term silver, such as German silver, Nickel silver, Liberty silver, etc. If such terms are legitimate then the term "silvore" and "silvel," and "pallidor," are equally legitimate. In the trade such alloys are understood, but to the consuming public they are deceptive. "Nickelene" or "Nickelaoi," giving the percentage such as 9-14-18 or 22% would be acceptable and interpret the true designation of nickel alloys.

Let us eliminate the unjust and misleading from our industries. Let us create American standards and terms that shall be American and good enough for the world to gauge their standards by.

Finishing Hand Wheel Rims

Q.—What method is employed in finishing the rims of machine hand wheels? These wheels are used on machine and woodworking tools.

A.—This finishing operation is performed by turning on a lathe with a formed tool followed by polishing. The use of a rotary milling machine and a formed milling cutter is considered by some to be superior to turning. The method followed in finishing or polishing is spinning the hand wheels on an arbor held by the hands against a felt wheel, of the correct radius, which is provided with a facing of abrasive. The surface speed of the rim is slackened to less than that of the polishing wheel by the pressure applied by the operator. P. W. BLAIR.

Cyanide Sores

The formula for a cure for Nickel Itch, printed in THE METAL INDUSTRY for May, 1922, page 187 is said to be effective also in the case of cyanide sores.

The Metal Industry

With Which Are Incorporated

THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER, THE ELECTRO-PLATERS' REVIEW

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Contents

EDITORIAL

THE PLATERS' CONVENTION

On June 28 the American Electro-Platers' Society will hold its Tenth Annual Convention in Cincinnati, O. Through the last two years, when other organizations were showing up or stopping altogether the A. E. S. marched on steadily. Conventions were held regularly, new members gained and excellent progress made. As an example of courage and steadfast devotion to its aims, it is second to none other, large or small.

The Society has gone far since its founding. The standard of papers read is immeasurably higher, the members much wiser and the Society stronger in every way, but there is still much work to do. Less than half of the platers eligible to membership have joined. The Monthly Review for March states that with only fifty-five to go, the 1,000 mark has been set as the next objective. The committee for the revision of the Constitution will report at the meeting. Also the question may come up of admission to membership of assistant foremen.

It is not only a duty but a vital necessity for each branch to send as many strong, forceful men as it can afford to the convention. Large issues are coming up and able men must be there to handle them. It is not a question of playing politics or getting all that is possible for any one particular branch, but of earnest consideration of the welfare of the Society as a whole.

The Tenth Annual Convention will be alive. No gathering of platers was ever anything else. We have every confidence, however, that it will result in more than a good time. Between the educational value of the papers presented, the exhibits and the results of the business meetings, all those who are fortunate enough to attend will be amply repaid.

THE FOUNDRYMEN'S CONVENTION

The Rochester meeting of the American Foundrymen's Association and the Institute of Metals Division held after a lapse of almost two years gave encouraging indications of the state of the industry as a whole. The attitude of the visitors showed that business is on the rebound. The slump is over. The bottom has been reached and the tendency is now upward. Of course, conditions are not easy but there are results to be obtained, whereas the last two years seemed almost like a forlorn hope. The technical sessions were capably planned and handled, the meetings being divided into various specialties, making them almost symposia. A high standard was maintained throughout and some of the papers were extraordinary in the light which they shed on what were old problems.

Among the important contributions was a paper by Pilling and Bedworth on The Mechanism on Metallic Oxidation at High Temperatures. This was, we believe, the first theoretical explanation of oxidation of metals attempted before the Institute. The paper is not only of considerable value in itself, but should stimulate further work on this phenomenon. A description of the Technical Control of the McCook Field Foundry by Dix was valuable as an indication of what technical control can do and how it should be organized. An Investigation of Segregation in High Lead Bronzes by Lee and Trace was interesting in view of the widespread occurrence of this particular trouble. It was unfortunate that no preprints abstracting the report were available, since this would have stimulated discussion considerably. As it was, however, it was generally agreed that the foundry practice advocated by the authors was excellent, in spite of some disagreement with their theories.

A symposium on aluminum brought out a great deal of useful material and had the effect of stimulating the desire of those present to continue these aluminum sessions at every convention.

Core Oven Tests by Wolf and Grubb gave very interesting figures on the comparative costs of operating fuel fired and electric core ovens. Woyski and Boeck started considerable discussion on the question of oxidation and gassing under various atmospheres in open flame furnaces with their paper on Gas Absorption and Oxidation of Non-ferrous Metals. The authors advocated the seemingly revolutionary theory that it was better to use an oxidizing flame than a reducing flame. More work will undoubtedly be done on this question as it opens up an entirely new field in metal melting.

The lavish entertainment provided by the local foundrymen, a part of which consisted of an outing on Lake Ontario and the extensive entertainment for visiting ladies kept the convention from being all work and no play. The American Foundrymen's Association and the Institute of Metals Division are to be commended for the Rochester Convention.

EIGHT-HOUR SHIFTS

According to a report by Dr. H. B. Drury, the head of a committee which has almost completed a survey of the entire nation on this question, "Labor efficiency is higher with three shifts of eight hours each, than with two twelve-hour shifts."

The committee working on this investigation has so far confined itself to industries other than steel. It finds there are forty to fifty industries which call for more or less continuous operation, that is twenty-four hour per day work. These include the heat-process industries, under which come metallurgical, ceramic and chemical. Another group is that of the public service industries. It is stated that some of the industries outside of steel are now predominantly on eight-hour shifts, but all except a very few have some plants on twelve-hour shifts, and in some industries a majority and even all of the plants are on twelve-hour shifts.

The committee assumes that the number of shift workers in the United States is somewhere between 500,000 and 1,000,000; the number of men on twelve-hour shifts is not far from 300,000 of which perhaps half are in the steel industry.

It was found that the results of substituting three shifts of eight hours for two shifts of twelve hours varied widely in different plants. It is said that in most of the plants which made such a change in the last few years, the efficiency was not greatly improved, but it is added that this might be charged to generally unfavorable labor conditions which prevailed, and that even under those conditions the increase in cost due to three shifts was apparently not large enough to be a serious handicap in competition. This statement is, of course, strange in the light of what seems to be an obvious rise in labor costs, but the report goes on to say that three-shift plants have maintained themselves in the same market as two-shift plants, and that during even the very severe depres-

sion of the last two years, very few plants have gone back from the eight-hour to the twelve-hour shifts; moreover, that there were instances in all types of industries where the introduction of three shifts resulted in a sharp gain in efficiency through the reduction in the number of men employed per shift or through the increase in output.

The committee seems to be coming to the conclusion that the change from two shifts to three will, in general, result in a substantial increase in labor efficiency, but not so great as to permit the payment of twelve hours pay for eight hours work, without increasing costs. It may be possible, however, to pay the men weekly wages based on an eight-hour day, which once they had become used to the eight-hour shift, they would much prefer to the alternative of twelve hours work and twelve hours pay.

A rough survey of some of the largest brass mills in the country seems to indicate that the brass industry is in agreement with the conclusions of Dr. Drury. These mills, which are operating their casting shops electrically, and are working 24 hours a day, prefer to use three shifts of eight hours rather than two of twelve. It seems to be the consensus of opinion that a twelve-hour shift is neither healthful nor natural. Although no figures are obtainable as to the comparative efficiencies of this shift, there seems to be no disagreement. It is also stated by one manufacturer that in the long run the men prefer to work eight hours for eight hours pay rather than twelve hours for twelve hours pay.

A statement from one manufacturer, in answer to a question about comparative production in eight and twelve-hour shifts, which, although only indirectly concerned with the eight or twelve-hour day, is extremely interesting, is as follows:

"It is practically impossible to determine relative production as we have not worked on the twelve-hour basis, but we believe that on the basis of eight hours a day it is higher. No comparison with pit fires can be made for the reason that the factors involved are so entirely unrelated as to not permit of any efficiency conclusions. There is no question but that the electric furnace method of making brass is so superior as to not warrant the slightest consideration of operating with pit fires wherever it can be avoided."

NEW BOOKS

Elementary Chemical Microscopy by Emile Monin Chamot. Published by John Wiley & Sons. Price, payable in advance, $4.25. For sale by The Metal Industry.

The work covers qualitative and quantitative analysis carried out under the microscope. This is the second edition, partly rewritten and enlarged, of a new lead in American chemistry. It should appeal to every metallurgist and chemist because of its enormous saving of time, labor, material and space, yet with increased sensitiveness of tests and greater certainty of results. Mastery over the microscopic can be gained by studying the chapters on objectives and oculars; illumination of objects, illuminating devices, microscopes for use in chemical laboratories; vertical illuminators, metallurgical microscopes; ultra-microscopes, apparatus for the study of ultramiscroscopic particles; useful microscope accessories, laboratory equipment, work tables, radiants; micrometry, micrometric methods. The description is simple and amply illustrated. The chapters dealing with chemical analysis include: quantitative analysis by means of the micoscope; the determination of melting and subliming points; the determination of refractive index by means of the microscope; crystals under the microscope; methods for handling small amounts of material; the methods of micro-chemical qualitative analysis; characteristic micro-chemical reactions of the common elements and acids when in simple mixtures; preparing opaque objects for the microscopic study of internal structure and a valuable appendix.

The value of microchemistry can be seen in the use of a single reagent such as potassium mercuric thiocyanate which furnishes one of the best and most generally useful methods for detecting the presence of zinc, copper, cadmium, and cobalt and will also furnish evidence of the presence of iron, silver, lead and gold. For the qualitative examination of simple salts and alloys it leaves little to be desired. Zinc yields an almost instantaneous precipitation of the compound $Zn(CNS)_2 . Hg(CNS)_2$ in pure white feathery crosses and branching feathery aggregates. Neither magnesium or aluminum interferes with this test. Copper yields beautiful branching dendrites and radiating masses of acicular prisms, yellowish green in color. Similar tests are likewise mentioned for these and other non-ferrous metals.—Dr. Nicholas Kopeloff, New York State, Psychiatric Institute, Ward's Island, N. Y.

Mind and Work by Charles S. Myers. Published by G. P. Putnams Sons. Price $1.75. For sale by The Metal Industry.

This suggestive little book by the well known English psychologist who is also a member of the Industrial Fatigue Research Board gives much more than the title promises. The title would seem to indicate a treatment of the mental factors involved in work, abstraction in which few have a great interest; the book actually gives a clear and interesting account of the factors of human behavior which are effective in increasing and curtailing the industrial output, and points ways in which intelligent recognition and control of various conditions of work may operate to increase rather than curtail such production.

Dr. Meyers data are not drawn from the laboratory, neither is his book the product of reflection unsupported by fact. Facts and figures drawn from the records of plants operating both in England and the United States support his conclusions.

The author for instance points out the advantages of adequate rest periods properly spaced in the working day, citing the case of men who were engaged in loading pig metal whose daily rate was 12½ tons. This was increased to 47½ tons, an increment of about 300 per cent when proper rest periods together with better selection of men and improved working methods were introduced; this with no more fatigue than by the old method. Again, the introduction of a 4-hour shift in a tin-plate factory increased the hourly output 11.5 per cent as compared with the hourly output of an 8-hour shift.

The chapter on Restriction of Output is especially interesting. Restriction is ascribed both to employer and employee, either of whom may practise it unconsciously or deliberately. Specific ways of restriction are noticed and discussed. Devices whereby it is detected and corrected are indicated.

Other chapters are on Movement Study, Fatigue Study, Selection Study, Systems of Payment and Industrial Unrest. Valuable references are attached to each chapter.

GOVERNMENT PUBLICATIONS

Cadmium in 1921.—By C. E. Siebenthal and A. Stoll. U. S. Geological Survey, Washington, D. C.

Sulphur and Pyrites in 1919.—By Philip S. Smith. U. S. Geological Survey, Washington, D. C.

Tin in 1920.—By Bertrand L. Johnson, U. S. Geological Survey, Washington, D. C.

Natural-Gas Gasoline in 1920.—By E. G. Sievers. U. S. Geological Survey, Washington, D. C.

Production of Platinum and Allied Metals in 1921.—U. S. Geological Survey, Washington, D. C.

Copper in 1920.—By H. A. C. Jenison. U. S. Geological Survey, Washington, D. C.

Lead Pigments Marketed in the United States in 1920 and 1921.—U. S. Geological Survey, Washington, D. C.

Chromite in 1921.—By Edward Sampson. U. S. Geological Survey, Washington, D. C.

Production of Fuller's Earth in 1921.—U. S. Geological Survey, Washington, D. C.

Production of Aluminum in 1921.—U. S. Geological Survey, Washington, D. C.

Natural Gas-Gasoline Produced in the United States in 1921.—U. S. Geological Survey, Washington, D. C.

Production of Alumina Chemicals in 1921.—U. S. Geological Survey, Washington, D. C.

Production of Bauxite in 1921.—U. S. Geological Survey, Washington, D. C.

CORRESPONDENCE and DISCUSSION

Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein.

The Metallurgist and the Brass Foundry

To the Editor of THE METAL INDUSTRY:

The paper by Mr. Korsunsky in your May issue states some conditions which are easily explained. For the past sixteen years the writer has been connected with the metallurgical department of the Massachusetts Institute of Technology. During that period there have been only four or five men who have shown any desire to enter the non-ferrous foundry industry. It is also true that very few non-ferrous foundries have asked to be furnished with graduates. Under these conditions is it strange that we have made no effort to prepare men specially for the work? If there is no demand either from foundries or prospective foundrymen, to what extent is it the duty of the technical schools to stimulate such a demand or in the modern vernacular to "sell" the idea? These specialized courses containing only a few men cost considerably more than the students can pay so they are an expensive luxury. Most schools, however, when convinced of their duty to render such service would be willing to do so. M. I. T. makes no pretence of turning out Electrical Engineers, Mechanical Engineers, or Metallurgical Engineers, but Bachelors of Science with special fundamental training along these various lines. They become engineers after acquiring experience. The men get enough laboratory work to make the theory clear, but there is not sufficient time for them to acquire the details of practice. M. I. T. is proud of its graduates who occupy high positions in the steel industry yet they received no more specialized training for this work than they received for non-ferrous alloy work. In every case they started at the bottom of the ladder to acquire their practical experience, but with their fundamental technical knowledge advancement was reasonably rapid. These same men would have made similar progress in the non-ferrous alloy field had their inclination been in that direction.

There is no branch of metallurgy, ferrous or non-ferrous, more difficult to teach than foundry work. So many "tricks of the trade" are known only to the foundrymen themselves that the schools are at a decided disadvantage in teaching the subject beyond the theoretical aspects of the case. A laboratory under the charge of a practical foundryman helps to overcome this difficulty. The metallurgical students together with students from some of the other courses at M. I. T. have a short course in foundry practice, but it seems unwise to devote to this course the large amount of time which would be required to train the experts that Mr. Korsunsky apparently thinks we should produce. The criticism he makes of the technical schools is one often heard from various industries. Each thinks that specialists should be produced for their particular benefit. These calls sound reasonable when considered individually, but if the schools heeded even a considerable percentage of them there would be so many small groups requiring special attention that the cost of instruction would be prohibitive and what is even more serious some subjects of fundamental and vital scientific and engineering importance must be left out of the curriculum to make room for the specialized studies.

There are many schools which are highly specialized along certain lines to fulfill a local need. Their graduates get good positions at once and make rapid advancement. It is the writer's opinion, however, that the man with equal native ability with the right fundamental training in science and engineering who must start at the bottom of the ladder to get his practical experience will in time go farther and prove to be a more valuable man to the industry.

The question regarding the choice of subjects for a four-year course is one which has vexed the scientific school for years and will never be settled to the satisfaction of everyone. There is room for improvement and no one realizes this more than the faculties of the schools. The demand that the courses be made "practical" is sound and cannot be disregarded, but the industrial world will be best served if the schools devote most of their time to teaching fundamental science and mathematics and the theoretical side of engineering, using laboratories to illustrate these principles and to show their application. With this equipment the young graduate can go boldly out to put on his overalls with the assurance that reasonably rapid promotion will come as he masters the operating details.

Boston, Mass., June 1, 1922. CARLE R. HAYWARD.

Casting Copper Bands with Brass Band Accompaniment

To the Editor of THE METAL INDUSTRY:

On page 182 of THE METAL INDUSTRY for May, 1922, we are informed by Nelson F. Flanagan, under the caption "Casting Copper Without a Riser," that back in 1916 he was handicapped as foreman of a copper foundry by the actions of a particularly obtuse superintendent who would persist in attempting to cast copper shell bands by methods contrary to those known by Flanagan. He tells us that just prior to that fateful day when the receiver took charge and proceeded to produce assets enough to pay his fees therefrom, they allowed Flanagan to try out a pet idea of his in the shape of a small gate, weighing only 1¾ pounds.

Assuming that the figures of his sketch are correct, the dimensions at the "choke" are ¼ in. x 9-16 in. in cross section, while the sprue, where the metal enters to feed the gate and castings, was ¼ in. in diameter. As the cross section of his sprue is in area .049 of a square inch, and his gate at the "choke" is .140, it follows that instead of a choke gate functioning as such, we have the very reverse, or what is known as a "drooler" or "dribbler" gate.

We are supposed to believe that in pouring off castings fed through a sprue, less in diameter than an ordinary cigarette, that the pouring gang were able to direct the stream of molten metal from the lip of a ladle or crucible, so as to hit a quarter inch round hole, without any flare and without the aid of a sharpshooter accustomed to hit nine bulls-eyes out of a possible six.

Fellow citizens, what a splash was there!!!

Mr. Flanagan informs us that neither risers or chills were present when his "choke" gate was on the job, and he tells the truth, only he does not tell it all as the castings should be included as among those missing.

Theoretically, a gate 2:85 times the area of the sprue can be fed and choked, with sufficient height of head, but not within the confines of an ordinary foundry. Again, the increased velocity necessary to produce this condition would call for two Venturi cones, one on each end of a very short orifice, but the orifices leading to and from the cones would need to be at least of the same area as the choke gate. Risers are not always necessary in the making of solid copper castings, though Flanagan would have us believe that he was the first to dispense with them; nevertheless, there are castings that neither he nor any other man can make without risers. Why anyone should use chills in casting copper shell bands is beyond me; possibly things were so darned hot in that joint of Flanagan's that they had to use chills somewhere.

Further along in his article we are told that with a pair of twin Nicholl's molding machines he got 300 molds in 9 hours, while with triplets by the same father he got 500 in 540 minutes, "with men who did not know what a mold was."

Something must have missed fire or the clock was a liar as the output of molds was about fifty per cent shy on that class of work; but as long he or his superintendent was responsible for the loss of all the castings why quibble over the restricted production.

Making hundreds of molds on the molding machines of today or in 1916 was and is no stunt at all, but to make good castings from such molds is something else again. Certainly the castings poured through a drooler or dribbler gate such as illustrated in Flanagan's sketch would take almost as many hours to fill as it took minutes to ram up.

WILLIAM H. PARRY.

Brooklyn, N. Y., May 20, 1922.

Technical Papers

A STUDY OF THE THROWING POWER AND CURRENT EFFICIENCY OF ZINC PLATING SOLUTIONS*

By W. GRENVILLE HORSCH AND TYLER FUWA.

This paper gives the results of a comparison of four distinct types of zinc plating solution. The effect of modifications in the composition of each type was studied. Using a three-section cathode, the throwing power, cathodic current efficiency, and cell voltage were determined for each bath and modifications. An alkaline cyanide bath was found to give the greatest throwing power; and by the device of employing an insoluble anode in parallel with the zinc anode of such area as to carry about 20 per cent of the current, such a bath could be made to give constant results for weeks by simply replenishing from time to time with small amounts of addition agents.

CONCLUSIONS

1. Zinc plating baths, the principal constituents of which are sulphate, fluoborate, or zincate, show small throwing power, although satisfactory deposits may be obtained with sulphate baths when anode and cathode are plane and parallel to each other.

2. Alkaline cyanide baths having the composition:

Sodium Cyanide	53.2 gms.	6.47 oz.
Zinc Cyanide	59.2 "	7.21 "
Sodium Hydroxide	43.8 "	5.33 "
Sodium Carbonate	9.5 "	1.16 "
Aluminum Sulphate	4.7 "	.57 "
Lignol	11.8 "	1.44 "
Water	1,000 c.c.	1 gal.

show high throwing power, moderately high efficiency, very low voltage, and give continuously good results when operated under proper conditions.

3. The proper conditions for operating the alkaline cyanide bath given above, continuously, were determined and found to be as follows: C.D., 2 amp./dm.^{2}; temperature, 40° C.; stirring, moderate; anode, composite of zinc and duriron, the duriron surface forming 30 per cent of the total anode surface. The use of an addition agent is necessary. Glue is fairly satisfactory, but "lignol" was found to be a better and cheaper material.

THE ACIDITY OF NICKEL DEPOSITING SOLUTIONS*

By M. R. THOMPSON

The colorimetric drop-ratio method of measuring the pH, or hydrogen ion concentration, is applied by the author to nickel solutions. The acidity characteristics of various types of nickel depositing solutions are described. The relation between pH and cathode current efficiency is determined. The effect of pH upon the structure and properties of the deposited nickel are illustrated.

*Abstract.

CONDUCTIVITY OF COPPER REFINING ELECTROLYTES*

By EDWARD F. KERN AND M. Y. CHANG.

The specific conductivities of solutions of sulphuric acid, copper sulphate, and of mixtures of sulphuric acid and copper slphate were determined at 25° C., 40° C., and 55° C. The concentrations of the solutions were 5, 10, 15, and 20 grams per 100 cc. Tables and curves are given for the several series of solutions, and for the different temperatures. The effects of the presence of arsenic, nickel sulphate, and ferrous sulphate upon the conductivity of a copper-refining electrolyte were determined, showing that the presence of arsenic does not appreciably depress the conductivity, whereas the presence of nickel sulphate and of ferrous sulphate depress the conductivity very much.

CONCLUSIONS

The conclusions drawn from the results of these determinations are:

(a) The copper content of refining electrolytes should be kept between 30 and 35 grams per liter (approximately 120 to 140 grams $CuSO_4.5H_2O$) and the free sulphuric acid as high as economy permits up to 175 grams per liter. With higher free sulphuric acid content the solubility of copper sulphate decreases rapidly, and also, the added increase in conductivity with more concentrated sulphuric acid is relatively not so rapid.

(b) Maintain the temperature of the electrolyte as high as economy permits. The economical temperature limit seems to be 55° C.

(c) Keep nickel and iron content of the electrolyte as low as possible, as the presence of sulphates of these metals greatly depresses the conductivity of the electrolyte.

*Papers presented at the Forty-first General Meeting of the American Electrochemical Society held in Baltimore, Md., April 27, 28 and 29, 1922.

HYDROGEN OVERVOLTAGE AND CURRENT DENSITY IN THE ELECTRODEPOSITION OF ZINC*

By U. C. TAINTON

1. Commercial electrolytic zinc is deposited from solutions which, from an electrochemical viewpoint, are to be regarded as necessarily impure and containing free acid.

2. The continued deposition of metallic zinc from such solutions depends on the maintenance of a high hydrogen overvoltage at all points of the cathode surface. This is attained by the maintenance at all points of a substantial current density, which, in turn, depends largely on the smoothness of the deposit.

3. By sufficiently increasing the current density the hydrogen overvoltage for all metals examined (lead, cadmium, copper, iron, nickel, cobalt, antimony,) may be made to exceed the potential of zinc on the hydrogen scale. This does not accord with figures obtained by the commutator method of measuring the variation of hydrogen overvoltage with current density, and it is believed that this method is unreliable.

4. The overvoltage of the alloys examined lies between the overvoltages of their constituents. In the case of zinc deposits containing impurities, the overvoltage is very high as long as the zinc surface is clean and growing. However, the overvoltage of an impure, corroded zinc surface is found to be very low, and so once corrosion begin (at a point of low current density), it tends continually to spread.

5. The function of colloidal matter such as gelatin in the electrolyte is to raise the overvoltage of hydrogen. It also lowers the contact angle of the hydrogen bubble, thus preventing adhesion of bubbles to the cathode surface. It tends to restrain crystalline structure of the deposit. All these factors tend to maintain smoothness of deposits.

6. Practical work indicates optimum conditions to be a free acid concentration of about 250 to 300 gm. per liter with a current density of about 100 amp. per sq. ft., and the presence of a minute quantity of gelatin or similar colloidal matter in the solutions.

CORROSION BY ELECTROLYTE CONCENTRATION CELLS*

By ROBERT J. MCKAY

Calculations of the E. M. F. generated on metal electrodes of the same metal by different concentrations of copper sulphate are given. Also, the results of determinations showing greatly accelerated corrosions of homogeneous metal in acid solution, due to differences in concentration of dissolved materials in the solution.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical; WILLIAM J. REARDON, Foundry — PETER W. BLAIR, Mechanical; LOUIS J. KROM, Rolling Mill — CHARLES H. PROCTOR, Plating-Chemical; R. E. SEARCH, Exchange-Research.

BLACK NICKEL ON GLASS

Q.—In the past week I made up a black nickel solution consisting of the following:

Water	1 gallon
Double Nickel Salts	8 ounces
Potassium Sulpho Cyanate	1 ounce
Zinc Sulphate	½ ounce
Ammonia Water	⅛ ounce

I am having a little trouble with the deposit being too soft. I am plating leaded glass bowls, and it takes about 10 to 15 minutes for one of these to come up nice and black, and when I scratch brush these bowls the deposit rubs off on the brush. It seems to me that it is not hard enough. My solution is neutral, stand between 5 and 6 Baumé. Now can you help me out with this trouble, or do I imagine this is trouble, by not plating them long enough.

A.—Black nickel solutions as you probably know do not deposit as rapidly as white nickel solutions.

From the statements you make we should infer that you obtain excellent results in 10 to 15 minutes.

If you use a higher voltage the deposit will be harder but of slightly grayish tone. If you add more acid more nickel will come over, which will also produce a harder finish.

It might be advisable to experiment with the addition of a little arsenic, as a possible hardener. For the purpose dissolve white powdered arsenic in muriatic acid by the aid of heat. Add only as much arsenic as the acid will consume. The operation is best done outdoors.

Use the arsenous chloride solution so prepared as a stock solution. Add as much to the solution as possible without detriment. Possibly half a fluid ounce will be ample. Try first by experiment on a five or ten gallon basis, and note results. Then treat your regular solution accordingly.—C. H. P. Problem 3,085.

BRASS PLATE ON ALUMINUM

Q.—Will you please let me know how I can brass plate heavy deposit on aluminum die casting composed of:

Aluminum	90%
Nickel	5%
Silicon	5%

The finish is heavy brass plated and buffed.

A.—To obtain a very heavy deposit of brass upon die-castings, without the possibility of the brass deposit blistering, either the one or the other of the following methods should be used:

1st. Cleanse as usual with mild hot alkali cleaners, low in caustic soda.

Flash for a moment or two in a warm cyanide of copper solution, and then plate in an acid copper solution for ten to fifteen minutes, and follow up with brass plating until the desired heavy deposit is obtained.

2nd. Cleanse as outlined above, flash in a warm cyanide copper solution, then plate for 5 minutes in the following nickel solution:

Water	1 gallon
Double nickel salts	8 ounces
White table salt	3 "
Sodium Citrate	3 "
Citric Acid	⅛ "

C. H. P. Problem 3,086.

BRASS PLATE ON ZINC

Q.—Would the zinc absorb the brass in the following method?

Electrogalvanize.
Brass plate.
Nickel plate.

A.—We do not believe an electro-deposit of zinc upon a steel auto bumper would absorb a deposit of brass if fairly heavy. Of course, there would be no distinct advantage in depositing brass upon the zinc except that it would be somewhat easier to deposit the nickel upon the brass surface than upon the zinc. The zinc surface, however, is the rust-proofing factor, not the brass or the nickel. But the nickel gives a more pleasing finish and at the same time prevents oxidation of the surface of the zinc.—C. H. P. Problem 3,087.

CONTAMINATED SILVER SOLUTION

Q.—I made up a silver solution containing 2 ounces of silver cyanide, 4 ounces sodium cyanide to the gallon; also put in 2½ lbs. caustic potash, 1 pint ammonia for the 150 gallons. I want to make a bright silver out of it, one that will, on a 20-minute run, be able to color up very easily without scratch brushing. For a brightener I added about 4 ounces benzol but it still works with that smut on. There is also a dark smut on the silver anodes. How can I remedy this solution?

Possibly this has something to do with it. The boss bought a second hand tank which contained brass solution but wanted me to put silver in it without relining with pitch, so I obeyed his orders against my will.

A.—It is possible that putting your newly prepared silver solution in the tank which was originally used for brass plating is the cause of the solution's depositing with a smut and a dark smutty coating on the anodes. Silver solutions easily become contaminated. The tank should surely have been lined with asphaltum before using. Very small amounts of copper and zinc remaining in the fibre of the wood would produce such results as noted. Four ounces of sodium cyanide to two ounces of silver cyanide are more than enough, and the benzol should have been added in small proportions.

It will be somewhat difficult to correct the solution immediately. It can be done by degrees.

The first addition should be sodium cyanide. Add one ounce per gallon and arrange to agitate the cathode or work rod when the work is in the solution.

Note the results after producing a few bathes. You may have to add more cyanide by degrees until the anodes stay clean or darken only slightly during plating, and become white the moment the current is cut off.

When this condition is reached, the addition of a little carbon brightener should bring up a clear white, bright deposit.

For the brightener use the following formula:

Bisulphide of carbon	1 ounce
Ether	2 ounces
Sodium cyanide	½ "

Add not more than one-quarter fluid ounce of the mixture to the entire solution. Repeat, if necessary, but avoid an excess or your silver solution may be worse than at present.

We feel sure, however, that if you follow these instructions carefully you will obtain the desired results, unless the solution is excessively contaminated with copper and zinc.—C. H. P. Problem 3,088.

FINISHING BRASS REFLECTORS

Q.—How should I finish off reflectors for auto lamps?

A.—Presuming that your reflectors to be refinished are made from brass, then the methods for successful results and a high lustre finish should be as follows:

1st. Cut down with tripoli and color buff with a white diamond or rouge composition.

2nd. Cleanse carefully and remove any oxide with a cyanide dip. Wash thoroughly and nickel plate for a few minutes. The nickel deposit should remain bright and clear.

Nickel solution.

Water	1 gallon
Double nickel salts	8 ounces
Epsom salts	1 "
Common salt	1 "
Citric acid	1/16 "

Voltage 2½ to 3. Plate for 5 minutes with ample current to give a uniform nickel deposit in 5 minutes.

After nickel plating wash thoroughly in water, the silver strike in the following solution at 5 to 6 volts.

Water	1 gallon	
Sodium cyanide	6 ounces	Use Steel
Silver cyanide	⅓ "	Anodes
Caustic potash	⅛ "	

Strike for a moment until uniformly covered. Then silver plate for 5 to 10 minutes in the following solution.

Water	1 gallon
Sodium cyanide	4 ounces
Silver cyanide	2⅓ "
Sal ammoniac	⅓ "
Bisulphide of carbon	1 drop
Sulphuric ether	4 drops

Mix the last two ingredients thoroughly at first in a little of the silver solution. Then add to the silver solution and mix thoroughly. Use silver anodes. Voltage 1 to 2½.

After silver plating, wash thoroughly in cold and boiling waters, and buff up with Canton flannel buffs, using lamp black and alcohol or powdered rouge and alcohol. A few drops of kerosene may be added to prevent too rapid evaporation of the denatured alcohol.

These are the methods used by auto lamp manufacturers. Follow them and you will obtain the same results.—C. H. P. Problem 3,089.

VOLTAGE FOR GOLD SOLUTION

Q.—We are installing a 10 gal. gold solution with 2—10 pennyweight anodes and 6 pennyweight of carpenters gold per gal. Now one voltage is 6. Does this have to be cut down to about 2 volts? I have been under the impression that it will, but the master electrician thinks 6 is O. K.

A.—Six volts are absolutely too high for gold solutions. If correctly prepared, 2½ to 3 volts are ample. Six volts will not give a pure yellow gold, but will incline it to a reddish tone.

Nichrome or steel piano wire can be used as resistance factor, but it is advisable to use a small transformer to reduce the voltage to three volts.

A solution composed as follows gives good results:

Water	1 gallon
Gold Chloride	⅓ ounce
Sodium Cyanide	1 "
Phosphate of Soda	¼ "
Bisulphite of Soda	⅛ "

Voltage 2 to 3. Temperature 160° F.—C. H. P. Problem 3,090.

MATT DIP FOR ALUMINUM

Q.—Can you give me a little advice in regard to a matt dip on aluminum. I have several hundred to do. They are called coin holders, 3½ inches long, 1 inch wide. I have tried caustic soda, but it is not very satisfactory.

A.—The usual methods of Matt dipping aluminum are as follows:

First.—Cleanse the excess of grease, etc., from the surface of the aluminum by washing the articles in benzine or gasoline. Dry out in maple wood sawdust.

Second.—Immerse the articles in a strong solution of caustic soda, 8 to 12 ounces per gallon. The articles will immediately turn a very dark tone, almost black, due to the formation of aluminum oxide. Remove and wash thoroughly in cold water. Then immerse the articles in undiluted nitric acid 38° for a moment. The oxide will be dissolved and a perfectly dead white surface will result.

Third.—Rewash carefully in cold and boiling water and dry out in fine maple wood sawdust. To facilitate drying a little whale oil soap should be added to the boiling water, about ¼ ounce per gallon.

If a more distinctly satin finish is desired, then you will have to produce the satin surface before cleansing and dipping by the aid of sand-blasting, or by a steel satin-finishing scratch-brush. No combination of dips will produce a distinctly satin finish.—C. H. P. Problem 3,091.

MOTTLED BLUE

Q.—How is the mottled blue on the barrels of cheap guns obtained?

A.—The mottled blue as noted on the metal parts of the stocks of guns is accomplished by heating the parts in cyanide-chloride mixture 73 to 76%, to a low cherry red, 1,150 to 1,200 deg. Fahr. They are then cooled in water to which is added one ounce of potassium nitrate per gallon. A light current of compressed air should be emitted from the bottom of the cooling receptacle. The mottling will then be more distinct and richer in coloring. The water must be maintained at 70 deg. Fahr. constantly, for the best results.

A very interesting article entitled "Rust Proofing of Iron and Steel Articles, New and Older Methods for Producing a Black Finish upon Steel," by Emanuel Blassett, may be found on page 6, volume 12. January, 1914, issue of the METAL INDUSTRY. This article will give you all the additional information you desire.—C. H. P. Problem 3,092.

NICKEL SOLUTION

Q.—I have started a new nickel tank which contains about 400 gallons.

Started the solution with 500 lbs. nickel sulphite (single salt), 75 lbs. salammoniac, 50 lbs. boric acid, 75 lbs. epsom salt.

The solution would not work. Its color is dark and it blisters and peels. Then I added common salt, a little salammoniac and a little of liquid ammonia, one-half pound carbonate of nickel. Still it makes a dark nickel and it blisters and peels.

The solution stands at 15°. It crystallizes all around the tank. Is there any way to save the solution?

A.—It is possible that your nickel solution, prepared as outlined, gives a too concentrated solution. Make a test with a ten or twenty gallon solution, reducing the solution, first 33⅓%, and then 50%, with water, and noting which density gives the best results.

For the 33⅓% solution use two-thirds solution and one-third water; for the 50% solution use half water and half solution.

It is possible that the solution will require free acid. You can try your present solution by adding ¼ ounce sulphuric acid per gallon (to the test solution add only ⅛ ounce per gallon) if they do not give the desired results.

We are of the opinion that reducing the solution as noted, and the addition of the acid will give you a satisfactory nickel deposit.—C. H. P. Problem 3,093.

PLATINUM CHLORIDE

Q.—How can I prepare platinum chloride?

A.—Platinum chloride is prepared exactly the same as gold chloride by the aid of aqua regia, i. e. nitric acid 1 part, muriatic acid 3 parts. Use a gentle heat, preferably a hot water bath, to heat up the acid.

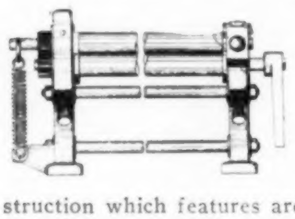
Place the amount of platinum you desire to dissolve in a porcelain receptacle, place on a hot water bath and add the acid in small quantities until the platinum is dissolved. Keep up the heating of the platinum chloride solution until it becomes of the consistency of syrup.

While we have given 1 part nitric acid to 3 parts muriatic acid, many platers use 1 part nitric to 2 parts muriatic acid. You can decide what combination gives the best results.—C. H. P. Problem 3,094.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,406,004. February 7, 1922. **Metal-Working Machine.** Paul R. Hahnemann, of Southington, Conn., assignor to the Peck, Stow and Wilcox Company, of Southington, Conn., a corporation of Connecticut.



This invention relates to machines for use in working sheet metal, for instance, rolling or curling sheets of metal into the form of a pipe or cylinder. The aim of the invention is to provide in a machine of this sort certain novel features of construction which features are of advantage in that they facilitate the removal of the sheet of metal from the mandrel on which it is shaped.

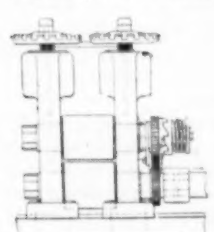
1,406,621. February 14, 1922. **Soldering Tool or Implement.** Samuel H. Dice, of Newark, N. J.

This invention relates, generally, to improvements in soldering tools; and, the present invention has reference, more particularly, to a novel and simple construction of soldering tool or iron adapted for easy attachment to a gas-conveying tube, the gas, such as illuminating gas, being conducted through the main body of the tool, and at a point near the soldering end of the tool being suitably intermixed with air which, at that point is also conveyed into the interior of the tool, so as to provide excessive heat for the proper use and manipulation of the tool during the soldering operation.

1,407,306. February 21, 1922. **Cutting Torch.** John H. Turpin and Otto B. Brookman, of Bremerton, Washington.

This invention relates to certain improvements in cutting torches, and it is an object of the invention to provide a device of this general character with novel and improved means whereby the same way be employed in connection with subaqueous work. Another object of the invention is to provide a torch of this general character wherein the tip has associated therewith a jacket providing means whereby, during a subaqueous operation, a pressure may be created sufficient to maintain the water displaced from the tip.

1,407,334. February 21, 1922. **Rolling Mill.** William H. Melaney, of Pittsburgh, Pa.

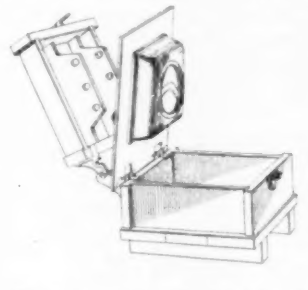


In a rolling mill, the combination with a housing, of a lower roll, an upper roll, said rolls being always held out of contact with each other, gears mounted on the roll necks meshing with each other, one of said gears being loosely mounted, connections between the other gear and suitable power and means carried by the said upper roll whereby when the metal is being rolled the friction created by the metal passing between the rolls relieves the gears of practically all rolling load developed in the reduction of the metal.

1,407,525. February 21, 1922. **Platinum Alloy.** Frank B. Fry, of Newark, N. J., assignor to the H. A. Wilson Company, a corporation of New Jersey.

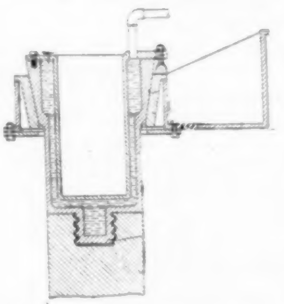
The new alloy consists of platinum and a relatively small proportion of either or both tungsten and molybdenum, molybdenum only being preferably used. The alloy should consist of platinum to the extent of from 85% to 95% and the molybdenum of tungsten from 15% to 5%. The proportions of the elements which I find to be producive of the best results are 93% platinum and 7% molybdenum.

1,405,929. February 7, 1922. **Appliance for Foundry Molds.** Harry McCorkel, of Laporte, Ind.

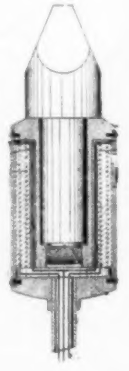


My invention relates to an appliance for foundry molds, and has for its object the provision of a device which will facilitate the handling and operation of a foundry mold. A further object is the provision of a device which will afford a means of pivotally connecting the various parts of a foundry mold. Another object is the provision of a device which will afford a means of pivotally loosely mounting a pattern upon a drag of a mold.

1,408,406. February 28, 1922. **Mounting for Electrodes with Cooled Metallic Head.** Curt Schraepler, of Essen-an-der-Ruhr, Germany, assignor to Fried. Krupp Aktiengesellschaft, of Essen-an-der-Ruhr, Germany.



The invention relates to metallic mountings for electrodes, with cooled metallic heads, to be suspended over the melting baths of electric furnaces, and has for its objects to attain, with such electrodes, first an easy replaceability, without detracting from the value and reliability of the circuit-closure between the mounting and the head of the electrode, and second, to render it possible to protect from unpermissible heat, the electrode-mounting that contains the conductor.



1,407,722. February 28, 1922. **Electric Soldering Iron.** William A. Braun, of Dover, Ohio.

This invention relates to improvements in electrical soldering irons, and the objects thereof are to construct the device so that its various parts may be disassembled and the soldering point and the heating element replaced by renewal parts as occasion may arise: to so arrange the heating element and control the current for exciting it that several different degrees of heat may be maintained as required; and to provide means for automatically controlling the current utilized in attaining the greater degrees of heat.

1,410,461. March 21, 1922. **Making Castings of Aluminum-Silicon Alloys.** Junius D. Edwards, of Pittsburgh, Francis C. Frary, of Oakmont, and Harry V. Churchill, of Pittsburgh, Pa., assignors to Aluminum Company of America, of Pittsburgh, Pa., a corporation of Pennsylvania.

This invention relates to aluminum alloys, particularly those containing silicon, and its chief object is to provide a method of making castings of such alloys which will improve the physical properties thereof, especially tensile strength and ductility. The invention is based on the discovery that the addition of sodium or potassium, or both, in metallic form, has an important effect upon the structure of the constituents, especially in the case of alloys containing silicon in substantial amounts.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

INTERPOLE DYNAMO

The advantages claimed for the interpole dynamo, made by the Hanson & Van Winkle Company, Newark, N. J., is that perfect sparkless commutation is obtained at all loads. In the old style non-interpole machine, the point of perfect commutation at which brushes should be set to avoid sparking varies, due to armature reaction or distortion of the magnetic fields, as the load on the dynamo varies. This results in sparking unless the rocker arm is shifted as dynamo load varies. To overcome this sparking in a non-interpole machine it is necessary either to shift the rocker arm as the load on the dynamo is varied, or to attempt to damp out sparking by the use of a great number of low-efficiency, high-resistance brushes. As there is practically no demand for a dynamo which requires the constant attention of a man to shift rocker arm as the dynamo load changes, the use of high resistance brushes is generally adopted. While such brushes tend to damp out minor sparking their high electrical resistance causes excessive heating when machine is run at or near rated capacity.

It is stated also that the large number of brushes and the extremely large commutators necessary cause high frictional heat and rapid wear both of brushes and commutator which require constant attention; and that because of its inefficiency and tendency to overheat, it is necessary for those purchasing an old style non-interpole machine, who wish to avoid dynamo troubles, to purchase a machine much larger than their actual requirements demand.

In an interpole machine it is claimed that the interpoles counteract armature reaction. As a result the point at which brushes must be set to obtain perfect commutation does not vary with dynamo load and rocker arm may be permanently set and sparkless commutation obtained from no load to full load. This permits the use of a small number of high efficiency low resistance brushes. There is no tendency to overheat. Because of the high efficiency of the interpole dynamo it is possible to give a performance and temperature guarantee.

INTERPOLE DYNAMO

MADSENELL NICKEL

Madsenell nickel, made by the Madsen Laboratories, 33 E. 17th street, New York, is a type of electrolytic nickel. Chemically it is almost pure nickel containing only .02 copper and .005 iron, with substantially no hydrogen. Electrolytic nickel has been made which is nearly as pure chemically as Madsenell nickel, but, it is claimed, not in a physical condition adapted for mechanical working.

Madsenell electrolytic nickel is said to be not only mechanically sound, but possessed of even a higher density than that of any other nickel. It is claimed to be not only more ductile than other types of nickel, but even more so than the best rolled copper; furthermore, to combine with its high ductility, considerable hardness and a high tensile strength. Its Brinell hardness is about 74 and its ultimate strength 72,000 pounds per square inch, with an elongation of 32 per cent. It can be hardened up to a Brinell hardness of 183 by mechanical working, without embrittlement. Furthermore, when hardened by mechanical working, it can be annealed.

Madsenell nickel is made in several different grades possessing different degrees of annealability. The best grade, called "Madsenell Special," possesses, after annealing, exactly the same physical properties as before. The standard commercial grades of Madsenell nickel, however, when annealed, are softened to a Brinell of about 70, but the ductility and malleability are not quite so high. In other words, this grade of nickel will not stand quite so much sharp bending as before annealing, but, it is claimed, will stand more than the best grades of copper after annealing.

A practical test is cited of the properties of Madsenell special electrolytic nickel. A bar ⅛-inch square and 8 inches long was drawn down to a wire .002" in diameter and 2,500 feet long without annealing, during which operation the tensile strength rose from 72,000 to 300,000 pounds per square inch, and the wire was still slightly workable. It was then annealed and its original elongation power nearly restored.

The result is said to be produced by an addition agent to the electrolytic bath and by using a new anode. Flat articles can, it is claimed, be deposited at 108 amperes per square foot. This rate produces .006" of nickel per hour.

The Madsenell process is recommended for use in several ways.
(1) Making flat sheets for mechanical working.
(2) Producing articles by direct deposition.
(3) Coatings.

The Madsen Laboratories do not manufacture or operate factories, but grant licenses for the use of these processes to manufacturers. An exclusive license has already been granted to the British America Nickel Corporation, Limited, for the fabrication of sheet nickel down to .005" in thickness and for tubing down to ¾" bore and/or 1 1/16" wall, and also to make the new anodes required for all other licensees under certain price restrictions. Licenses for the use of Madsen patents for making all other articles are open to negotiations.

DUROBRITE

The Roessler and Hasslacher Chemical Company, New York, manufacturers of chemicals, is about to place upon the market a new white metal under the above name. This metal is intended to replace nickel plated brass or nickel plated steel, now used extensively in many lines. The metal is of a white color, solid throughout and, it is claimed, surpasses any of the nickel alloys; it is almost as white as silver. The manufacturers state that it is malleable and ductile, and has all the working properties of a high grade brass; that the tensile strength equals that of a mild low carbon steel; that it can be soldered and brazed like any of the non-ferrous alloys. In the automobile industry this metal can be used because of its durable white finish and its ability to withstand atmospheric influences without rusting or tarnishing. This metal is intended to stand in the class between the so-termed nickel silver alloys and sterling silver.

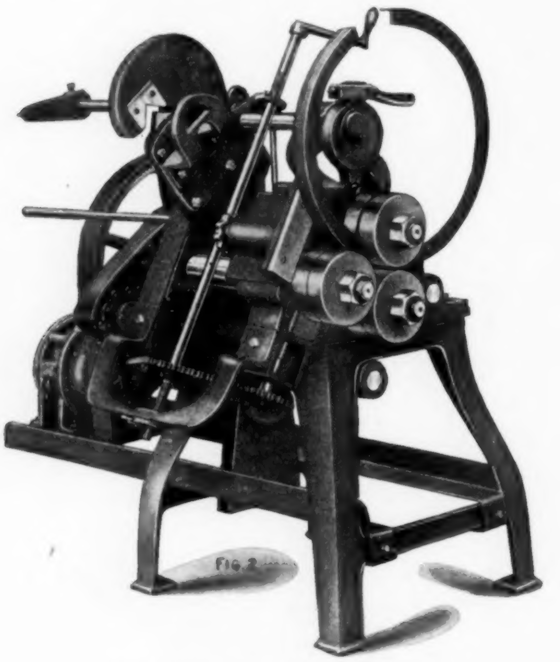
AIR SCRUBBER

The Eureka Air Scrubber is designed to prevent sporting and improve the finish in coated articles. No claim is made that it will prevent spotting from cyanide and solution causes, but it is guaranteed to prevent oil, vapor or gassified oil from passing into pipes, and to deliver absolutely pure air to the sprayers. The scrubber, it is claimed, removes all impurities from the air. It is manufactured by the Eureka Pneumatic Spray Company, 62 Ninth avenue, New York.

BENDING MACHINE

The Excelsior Angle Iron Bending Machine, No. 14, made by the Excelsior Tool & Machine Co., East St. Louis, Ill., has, it is claimed, many advantages.

This machine will cut to length and bend 2" x 2" x ¼" angle to a true circle without twisting or defacing the angles. Also ½" x 4" bar iron and 2" tee iron and less can be formed with the same rolls, which are adjustable to the various requirements. Special rolls for pipe, channel iron or any shape within the capacity of this machine can be furnished to order.



EXCELSIOR BENDING MACHINE

All three rolls are driven so that small circles can be rolled by one pass through this machine with the ends close together, by reversing the angles allowing them to pass through the machine twice, both ends will be true to the circle.

The machine is operated with a patented friction clutch, both belt and motor drive and can be started and stopped under pressure. The frames are semi-steel, the rolls are made from forged tool steel, hardened and driven by heavy chain gears 14 to 1 ratio.

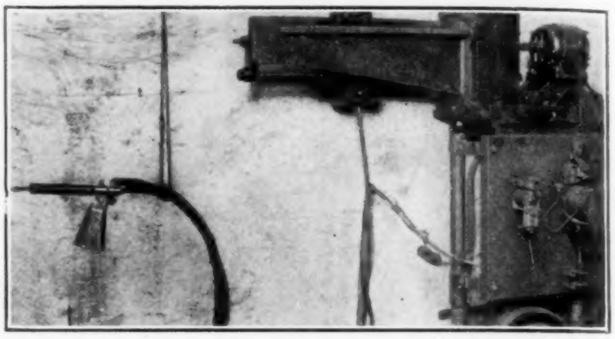
Pulley 24" x 4". Speed 200 R. P. M. Shafts 3" diameter, rolls hardened tool steel, 7" x 2" face. Speed of rolls 15 R. P. M. or 25 lineal feet per minute. Power required 3 H. P. This machine can be furnished either belt or motor driven, with or without cutter attachment. Brass and aluminum can also be bent.

SEMI-AUTOMATIC ARC WELDING LEAD

A semi-automatic arc welding lead has just been developed by the General Electric Company, for use in conjunction with its automatic arc welding head, which it is claimed, retains the continuous features of the automatic apparatus, yet allows the operator to direct the arc as required by the conditions of the work.

The apparatus consists of a welding tool to be held by the operator, which acts as a guide for the electrode wire. In the handle of the tool, which greatly resembles an automatic pistol, is a switch for operating the control on the panel of the automatic welder to start and stop the movement of the electrode wire. Attached to the tool is a 10-foot length of flexible steel tubing, called the "flexible wire guide," with an adapter on the other end for attaching it to the automatic welding head. The wire passes from the feed rolls of the head into the flexible tubing, and thence to the arc through a "guide nozzle" in the welding tool. The automatic welder functions in its accustomed manner, tending to hold the arc length constant, and the operator merely directs the arc as required by the particular job in hand.

The field of application of the semi-automatic is the welding of products where the seams to be welded are of very irregular contour, or on very large work where the travel mechanism and clamping necessary for the full automatic welder would be complicated and costly. In many cases the edges of the seams



SEMI-AUTOMATIC ARC WELDING HEAD

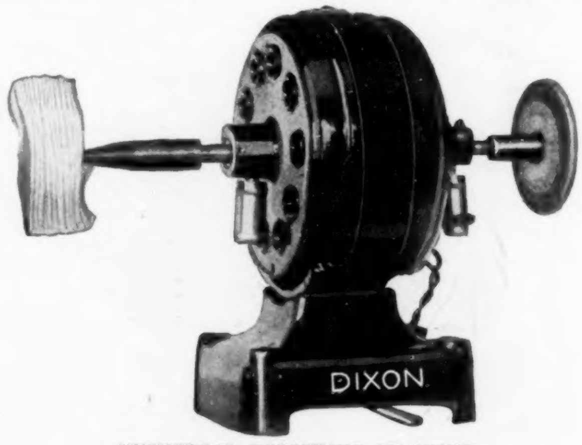
are not accurately prepared, making gaps in some places, and tight fits in others. The automatic welder with mechanical travel cannot compensate for these conditions by varying the speed, or by manipulation of the electrode, but with the semi-automatic they are taken care of.

The semi-automatic welder can also be used for building up metal rapidly, as in the case of the filling up of blow holes in castings, or the building up of worn spots, etc. The speed of deposition of the metal varies widely, being somewhere between the ordinary hand speed and that of the automatic, according to the conditions of the particular job. In general it is claimed to be about twice as fast as hand welding.

UNIVERSAL POLISHING MOTOR

The motor shown in the illustration has been brought out, it is stated by the manufacturers, to fill the need for a rugged construction universal electric motor which would run on alternating current and direct current with the same winding for doing all classes of polishing and grinding work.

The motor is rated as 1/10 H. P. but on the high speeds will deliver ⅛ H. P. It will run on 110 volts DC or 110 volts, 60, 40 or 25 cycles AC. It is provided with one taper attachment on one end of the shaft for holding soft wheels and on the other end an attachment for holding hard wheels such as emery wheels.



UNIVERSAL POLISHING MACHINE

The shaft has a diameter of ⅜" to eliminate the vibration which would be gotten from a lighter shaft. The bearings are of bronze with oil cups arranged so that the oil returns to the cup after circulation. In the base of the motor is located a three-speed regulator giving a very wide range of speed from about 5,000 R. P. M. to 1,500 R. P. M.

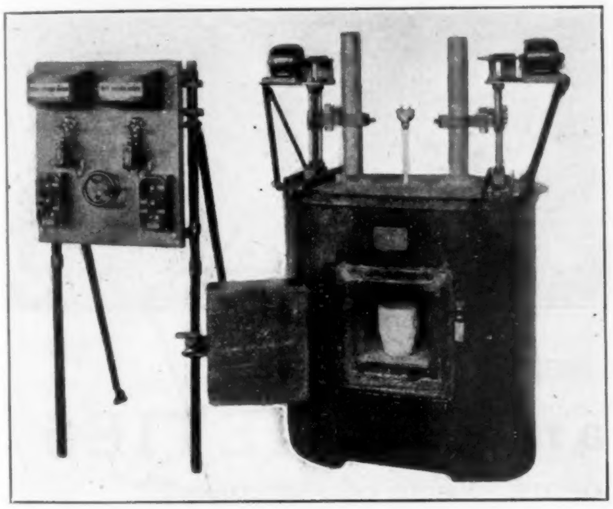
Any additional information will be furnished upon request by William Dixon, Incorporated, 32-35-36 E. Kinney street, Newark, N. J., 119 Fulton street, New York.

50 POUND METAL MELTING FURNACE

The 50 pound electric furnace as developed by the General Electric Company is a single phase, muffled arc furnace, automatically controlled. It is said to melt yellow brass, pouring at 1100° C at the rate of from 100 to 125 lbs. per hour with a power consumption of from 35 to 40 KWH per 100 pounds of metal, providing the furnace is up to temperature at the beginning of the run.

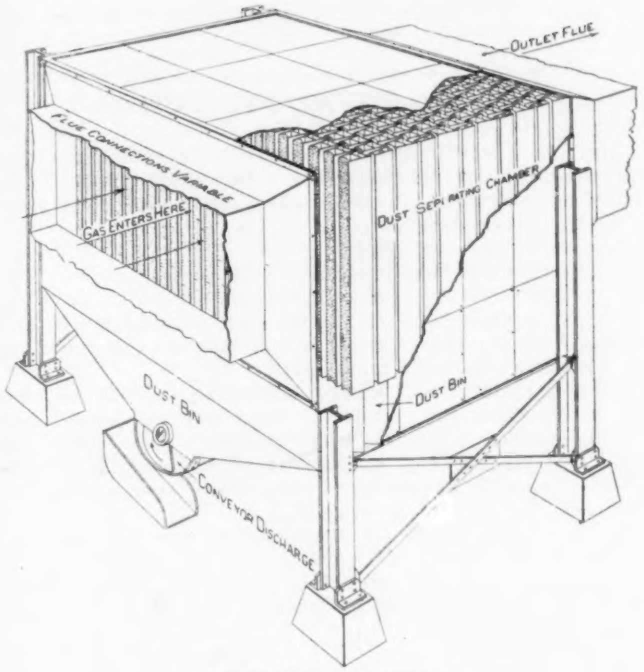
The hearth of the furnace is flat, and is designed to receive standard graphite crucibles. Two carbon electrodes extend through the roof to two wearing blocks, which are on the ends of a horizontal carbon block which extends across the bottom. This horizontal block and the wearing blocks are embedded in crushed graphite, which muffles the arc, and the hearth is located between the wearing blocks. The electrode regulation is automatic, being acomplished by two small motors driving the electrode holders, and actuated through the automatic control panel.

The heat is transmitted to the charge by both radiation and absorption. The current flows from the vertical electrodes through arcs to the crushed graphite and the wearing blocks. The whole mass becomes heated; the heat from this source is radiated to the metal from all directions, as well as being absorbed from the muffles and the hearth. The atmosphere of the furnace, it is claimed, is free from oxidizing gases, and other agencies that would contaminate the metal.



SMALL MUFFLED ARC FURNACE

DRY DUST COLLECTOR



DRY DUST COLLECTOR

The Reverse Nozzle Dry Dust Collector is placed at any point in the flue system and the dusty gas or air is either drawn through the machine by the stack draft when this is sufficient or propelled through by a fan, usually on the suction side, which then discharges the clean gas into the stack. It consists of a tight box through which the gas passes in a horizontal direction.

The dust catching section is built up of duplicate unit boxes, each of which consists of curved perforated front and back, two flat sides and a tight central partition. The top is closed by the cover of the machine and the bottom rests on the floor grid over the dust bin.

These boxes are narrow and of small length, but extend from the top of the machine to the dust bin. When assembled in the machine, they form numerous nozzle shaped gas passages between the sides of adjacent boxes, the outlet of which discharges on the curved front of the following set of boxes.

The dust bin is varied to meet the requirements of the service. It is sectionalized by partitions which correspond with those in the center of the boxes to prevent the flow of gas through it. The dust is removed by a conveyor or dumping doors into a convenient receptacle.

The machine has no moving parts. The high nozzle velocity and reversal of the gas. it is claimed, catches the dust as the gas passes through the machine. On entering the machine, the gas is separated into numerous narrow vertical streams by the deflectors in the distributing chamber. The streams impinge on curved perforated plates which form the front of the boxes. Behind these perforated plates are the still air settling spaces formed by the two sides and the vertical partitions in the box. The top and bottom of the machine makes these spaces tight pockets of air which do not move with the gas stream.

A particle of dust thrown through the perforations either by direct impact, or by centrifugal action as the stream is rapidly reversed on itself, passes out of the gas stream into the still air space and falls into the dust bin below. The perforations in the metal act like a screen to separate the dust from the gas and a particle of dust need only move a very small fraction of an inch to be through the screen into the still air space and out of the influence of the high velocity gas stream.

By the front plates the gas stream is deflected 180 degrees around the curved surface until it has entirely reversed its direction and flowing in the opposite direction a short distance, impinges on similar perforated plates forming the back of the box.

In the rear of this perforated plate another still air space is formed by the two sides and partition in the box. This acts in a similar manner to drop the dust into the dust bin. The back curved plate again deflects the gas 180 degrees back to the original direction, where it enters the passageway formed by the sides of the adjacent boxes, making a straight run until it comes in contact with the curved perforated surface of box No. 2, where the gas undergoes the same reversal and the process is repeated as often as there are boxes.

The machine is made by the By Products Recoveries, 328 Seventh avenue, New York.

WOODISON EXHIBIT

The exhibit of the E. J. Woodison Company, at Rochester, included core and molding machines, foundry supplies, platers and polishers supplies, and they were represented by the following representatives: E. J. Woodison, president; C. H. Woodison, vice-president; J. C. Woodison, secretary; Geo. A. Burman, manager core oil dept.; A. W. Ferguson, sales manager; A. J. Jordan, Boston manager; W. J. Wark, Buffalo manager; R. S. Hoffman, Cleveland manager; H. Z. Dingee, Philadelphia manager; M. A. Bell, St. Louis manager; C. F. Witters, Milwaukee manager.

Also the following salesmen: E. A. Mead, J. A. Carpenter, F. F. Shortsleeves, C. D. Pinkerton, Ray Higgins, Geo. Quinn, Wm. Muir, J. Jerosky, W. W. Wright, R. A. Burritt, Geo.

Donoghue, H. T. Taylor, W. W. Bowring, E. C. Schafer, Wm. Maybank.

MOLTEN-METAL PYROMETER

The Tycos Molten-Metal Pyrometer Outfit, which is designed for measuring the temperatures of molten metals by the Taylor Instrument Companies, Rochester, N. Y., consists of three parts:

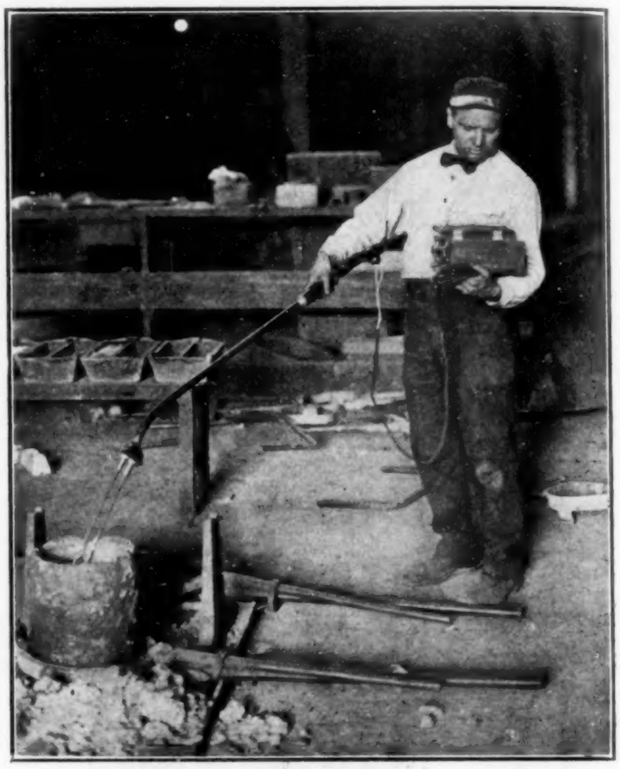
1. The Thermacouple.
2. The Indicator, or Meter.
3. The Flexible Connecting Cable.

THERMOCOUPLE

The Tycos Molten-Metal Thermocouple is designed and built to withstand the severe service encountered in foundry use, and the following advantages are claimed:

1. It is made of steel tubing, forming an angle at the lower end which allows the operator to stand in a natural and comfortable position at the side of the crucible. This feature does away with the necessity for standing almost over the crucible, as when using a straight-type thermocouple, thus avoiding objectionable and harmful fumes, etc.
2. The binding posts for attaching the connecting cable are located on the under side of the top fitting; thus allowing the thermocouple, when not in use, to be placed in an upright position on its end, without danger of breaking or wearing the flexible conductor at this point.
3. The handle is located at a convenient point so that the thermocouple can be comfortably held with the upper fitting under the operator's right elbow.
4. The lower fitting and connection terminals are of substantial construction and are thoroughly insulated by a special heat-resisting, insulating material.
5. The replaceable tip, or junction, of the thermocouple itself consists of ¼"-diameter, nickel-chromium elements, and is securely fastened into the terminals by heavy set-screws. The positive terminal is drilled deeper than the negative, the length of the elements of the junction corresponding. This renders it impossible to reverse the polarity of the thermocouple when inserting a new junction, thereby causing an erroneous indication, an important consideration when unskilled labor is employed.

The Molten-Metal Thermocouple will indicate almost instantaneously upon insertion in the crucible. The elements making up the replacement junction are of large cross-section, which is said to insure their rendering a satisfactory period of use before replacement is necessary due to the corrosive action of certain metals; particularly brass and bronze.



TYCOS PYROMETER

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

BRIDGEPORT BRANCH, A. E. S.

HEADQUARTERS, CARE F. J. SPAINE, 1323 N. AVE.

On Saturday, June 10, this branch held an outing at The Farm, Black Rock. The early afternoon found those present enjoying indoor and outdoor sports, especially the ball game between the fat men and thin men. Jack Oberender's fat men won, score 13-7. At 5.30 dinner was served. This outing was one of the most successful ever held by any branch of the Society and the Committee, with George J. Karl as chairman, deserves a great deal of credit for arranging and executing such an attractive program.

INDIANAPOLIS BRANCH, A. E. S.

HEADQUARTERS, C/O LOUIS MERTZ, 1725 UNION STREET

The branch held its regular meeting May 13th with a fair attendance. One new member was elected. The following officers were elected for the coming year: President, R. Hennessey; Vice-President, H. Maze; Sec.-Treas., Louis Mertz; Librarian, B. D. Aufderheid; Board of Managers, Wm. Lamoureux, R. McCracken and Geo. Barrows. Delegates to convention, B. Aufderheid, Geo Barrows and R. McCracken; alternates, Wm. Lamoureux, R. Hennessey and H. Maze. The motion was passed and carried that the branch defray the expenses of the Secretary to the Convention as compensation for services rendered.

NEW YORK BRANCH, A. E. S.

HEADQUARTERS, CARE E. HAAS, 75 WARNER AVE., ELMHURST, L. I.

The regular meetings of the New York Branch of the A. E. S. were held April 14 and 28 at the Broadway Central Hotel. President J. A. Stremel presided.

The main topics for discussion were terra cotta, green and yellow finishes, zinc plating and Japanese bronze.

The regular meetings of New York Branch of the A. E. S. were held May 12 and May 26 at the Broadway Central Hotel. President J. A. Stiernel presided at the first meeting, Acting President Wm. Fisher presided at the last meeting. Nominations and election to office are as follows: President, Phillip Morningstar; vice-president, Wm. Fisher; secretary and treasurer, John Sterling; recording secretary, Arthur Grinham; librarian, G. Wilson; sergeant-at-arms, James Eagon; assistant sergeant-at-arms, Benjamin Cross; trustees, Emil Haas, Joseph Minges, Elias Schor, Thomas Haddow, Wm. Voss, Fred Houshalter.

AMERICAN ELECTROCHEMICAL SOCIETY

HEADQUARTERS, BETHLEHEM, PA.

The Society held a most successful and interesting meeting in Baltimore, Md., during the days of April 27, 28 and 29. One of the outstanding features of the program was the conferring of honorary membership upon Dr. Carl Hering, one of the founders

of the Society and an ardently interested worker in its affairs. He is a noted electrical engineer and has made extensive studies on electric furnaces.

It was decided, at this Spring Meeting of the Society, that the Fall Meeting be held in Montreal, Canada, with headquarters at the Hotel Windsor; the time of meeting being fixed at September 21, 22 and 23, 1922.

New officers of the Society are as follows:

President—Carl G. Schluederberg, Westinghouse Electric & Manufacturing Co., Pittsburgh.

Vice-Presidents—H. C. Parmelee, editor Chemical and Metallurgical Engineering, New York; A. H. Hooker, Hooker Chemical Co., Niagara Falls, N. Y., and W. S. Landis, American Cyanamid Co., New York.

Secretary—Dr. Colin G. Fink, 101 Park avenue, New York.

Treasurer—F. A. Lidbury, Oldbury Electrochemical Co., Niagara Falls, N. Y.

Managers—A. T. Hinckley, National Carbon Co., Niagara Falls, N. Y.; W. M. Corse, National Research Council, Washington, D. C., and William Blum, Bureau of Standards.

OFFICERS OF THE ELECTRO THERMIC DIVISION

Chairman—Bradley Stoughton, Consulting Engineer, New York City.

Vice-Chairman—John A. Mathews, Crucible Steel Co. of America, New York City.

Secretary-Treasurer—Colin G. Fink, Consulting Electrometallurgist, New York City.

Directors—George K. Elliott, the Lunkenheimer Co., Cincinnati, O.; J. H. Parker, Carpenter Steel Co., Wyomissing, Pa.; W. J. Priestley, U. S. Naval Ordnance Plant, So. Charleston, W. Va.; D. A. Lyon, Bureau of Mines, Washington, D. C.

OFFICERS OF THE ELECTRO-DEPOSITION DIVISION

G. B. Hogaboom, Chairman; Charles Witherell, Vice-Chairman; William Blum, Secretary-Treasurer; Lawrence Addicks, E. F. Kern, F. C. Mathers and O. P. Watts, Directors; W. E. Hughes and Bertram Wood, Foreign Representatives.

Below are some subjects for possible future symposia:

Electrolytic Deposition of brasses and bronzes on a commercial scale.

Effect of X-rays, cathode-rays, etc., on various materials and chemical compounds.

Comparative study of electric furnace design and performance.

Comparative study of the various metal silicides.

Studies of the properties of barium metal.

SOCIETY FOR TESTING MATERIALS

HEADQUARTERS, 1315 SPRUCE STREET, PHILADELPHIA, PA.

The program of the Twenty-fifth Annual Meeting to be held in Atlantic City, June 26-30, 1922, includes the following papers:

FIRST SESSION—TUESDAY, JUNE 27, 9.30 A. M.
ON NON-FERROUS METALS, METALLOGRAPHY AND CORROSION

Report of Committee B-1: On Copper Wire. J. A. Capp, Chairman.

Report of Committee B-2: On Non-Ferrous Metals and Alloys. William Campbell, Chairman.

Presenting new Tentative Specifications for Brass Pipe, Copper Tubing and Admiralty Condenser Tubes, and Tentative Methods of Chemical Analysis of Brass ingots and Sand Castings and of Bronze Bearing Metals; also tentative revisions in Specifications for Pig Lead and for Aluminum for Remelting and Rolling.

Transmitting a report of an investigation, made by the U. S. Bureau of Standards at the request of the committee, of the physical properties of the twelve tentative standard A.S.T.M. white metal bearing alloys.

Report of Committee D-14: On Screen Wire Cloth. R. W. Woodward, Chairman.

Presenting Tentative Specifications for Non-Ferrous Screen Wire Cloth.

Report of Committee E-4: On Metallography. W. H. Bassett, Chairman.

Presenting Tentative Methods of Metallographic Testing of Non-Ferrous Metals.

Physical Properties of Some Copper-Silicon-Aluminum Alloys when Sand Cast. E. H. Dix, Jr., and A. J. Lyon.

Demonstrating the remarkable casting qualities of these alloys. They possess the property of being cast without chills and around steel barrels or hard cores without cracking. They may replace Alloy No. 12.

Preliminary Notes on Corrosion. W. D. Bancroft.

A brief resumé of the corrosion problem, suggesting certain desirable lines of study applicable to both ferrous and non-ferrous metals.

Discussion: On Corrosion of Non-Ferrous Metals.

To inaugurate the work of the recently organized Committee B-3 on Corrosion of Non-Ferrous Metals and Alloys, the Committee on Papers is planning a discussion of certain features of the preceding paper as related to specific corrosion problems in the non-ferrous industry.

Report of Committee A-5: On Corrosion of Iron and Steel. J. H. Gibboney, Acting Chairman.

Report of further inspection of sheets in atmospheric corrosion tests and of sheets in total immersion corrosion tests.

A Method for Determining the Spelter Coating on Iron and Steel Sheets by Measuring the Rise in Temperature of Acid Employed. D. M. Strickland.

Includes test data comparing the new method and the older hydrochloric acid method in which loss of weight is determined directly.

Report of Committee E-1: On Methods of Testing. J. A. Capp, Chairman.

Reporting substantial progress in study and review of Society's methods of testing. Report of Sub-Committee on Revision of Methods of Testing Metals, including proposed definitions of fundamental terms and revised methods of calibration. Resumé of cooperative investigation of methods of distillation. Report on harmonizing methods of determining water in bituminous materials, and methods of determining flash point.

Report of Committee E-8: On Nomenclature and Definitions. Cloyd M. Chapman, Chairman.

Reporting progress made in the coordination of definitions of terms. Tentative definitions of terms relating to paints, hollow tile, lime, gypsum, textiles, and certain miscellaneous terms have been reviewed by the committee and recommendations submitted to the respective standing committees.

NOMINATIONS FOR OFFICERS

For President—George K. Burgess.

For Vice-President—W. H. Walker.

For Executive Committee—D. M. Buck, W. M. Corse, W. K. Hatt, J. R. Onderdonk.

COMMITTEE B-3 ON CORROSION OF METALS

The new standing committee on Corrosion of Non-Ferrous Metals and Alloys was formally organized at a meeting in New York on February 21 at which Vice-President George K. Burgess acted as temporary chairman.

At the meeting the following officers were elected: Chairman, E. C. Lathrop; Vice-Chairman, W. D. Richardson; Secretary, Sam. Tour.

BRITISH INSTITUTE OF METALS

HEADQUARTERS, WESTMINSTER, S. W. 1, LONDON, ENGLAND

Transmutation of the Elements.—Sir Ernest Rutherford, F. R. S., who has recently been elected president of the British Association, is delivering the twelfth annual May lecture before the Institute of Metals at 8:00 p. m. on Wednesday next, May 3. The work which has lately been done concerning the transmutation of elements lends especial interest to the discourse, the subject of which is "The Relation of the Elements." Cards of invitation to the lecture are obtainable from Mr. G. Shaw Scott, M. Sc., secretary, The Institute of Metals, 38 Victoria St., Westminster.

Swansea Meeting of The Institute of Metals.—The annual autumn meeting of the Institute of Metals will be held at Swansea on September 20-22. A ballot for the election of members and students desirous of participating in this and other meetings of the Institute will take place on July 13. Membership particulars can be obtained from the Secretary of the Institute of Metals, 38 Victoria St., S. W. I.

Corrosion of Condenser Tubes.—A second and revised edition has just been issued by the Corrosion Research Committee, 36 Victoria St., S. W. 1, of the valuable pamphlet entitled "Notes on the Corrosion and Protection of Condenser Tubes." The document, which is published at 2s. 8d. post free, is intended to be of service to manufacturers of tubes and condensing plant and to the engineers who use them. It is of an essentially practical character, and embodies the results of ten years' research. The first edition of 1,000 copies was exhausted within a week of publication. The new edition contains much valuable additional matter.

Personals

Franklin S. Jerome has been elected president of the Seymour Manufacturing Company, Seymour, manufacturers of alloyed metals, and Clayton S. Boies, treasurer, to succeed the late George E. Matthies, who was both president and treasurer.

G. M. Sherman, formerly representing the Quigley Furnace Specialties Company, has become connected with the Keystone Refractories Company of New York and has been made New England Sales Manager with offices at 818 Hospital Trust Building, Providence, R. I.

L. E. Rice, for many years connected with the Niagara Emery Mills of Lockport, N. Y., has accepted a position as salesman with the General Abrasive Company, Niagara Falls, N. Y.

Alfred Pritchard of Newark, N. J., has been given complete charge of the rolling, lacquering and plating departments of the National Chain Company, Belleville, N. J.

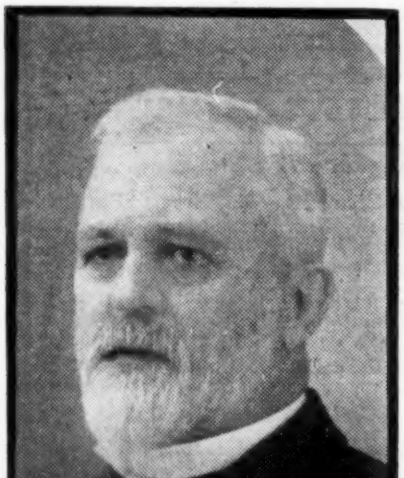
Thomas B. Haddow, for the past 12 years in charge of the plating and finishing department of August Goertz and Company, Jersey City, N. J., has joined the sales department of Maas and Waldstein, manufacturers of lacquers, 45 John street, New York. He will represent the company in New York City and New Jersey. Mr. Haddow is widely known to the trade through his activities in the New York Branch of the American Electroplaters' Society, of which he has been president. He is at present Chairman of the Board of Trustees of the New York Branch.

Charles S. Barbour, who for the past two years has been in the Electrolytic Section of the Bureau of Engraving, Washington, D. C., has resigned to get back into commercial work.

Deaths

BENJAMIN HIEL BRISTOL

Benjamin Hiel Bristol, for long president of the Bristol company, and one of the best known manufacturers in the Naugatuck Valley, died at his home in Platts Mills, May 25. Mr. Bristol was badly injured when hit by a trolley car last July. His hip was broken and he was confined in the hospital for seven weeks, but never fully recovered from his injuries. He was born in Naugatuck June 19, 1837, the son of Hiel and Anna C. Potter Bristol. He was educated in the public schools of Naugatuck and later entered the employ of the Platts Mills Company as a mechanic and as a foreman from 1860 to 1900. He assisted in organizing the Bristol company in 1889 and was president and treasurer of the company until a few years ago. He was married three times, his first wife being Pauline S. Phelps, whom he married in 1858, died in 1877. His second wife was Mary E. Russell, whom he married in 1878 and who died in 1897. He married Sarah J. Milligan in 1902, who died in April, 1918. Six children were born to Mr. Bristol and his first wife, of whom five survive. They are William H. Bristol, president of the Bristol company; Mrs. Sadie Bristol Smith, of Massachusetts; Bennett B. and Edgar H. Bristol, of Foxboro, Mass.; and Mrs. Ellsworth B. Tracey, who lived with him. A son, Frank B. Bristol, was killed a number of years ago in a train accident. Mr. Bristol was a Republican, a Congregationalist, a Mason and a Son of the American Revolution.—W. R. B.



BENJAMIN HIEL BRISTOL

J. A. B. LANDELL

J. A. B. Landell, of the Hanson and Van Winkle Company, died on June 2, at his home 3 Cottage street, South Orange, N. J., aged 34. Mr. Landell was a graduate of the University of Pennsylvania, having received the degree of chemical engineer from that institution. His business house regrets his loss and believes his death will be keenly felt as he had a pleasing personality and was well liked.

DR. HENRY M. HOWE

Dr. Henry M. Howe, professor emeritus of metallurgy at Columbia University and a scientist of international repute, died May 8, 1922, at his home in Bedford Hills, N. Y. He was the son of Julia Ward Howe, a native of Boston, and a graduate of Harvard and the Massachusetts Institute of Technology.

He was president of the American Institute of Mining Engineers in 1893, and three times of the Alumni Association of the Massachusetts Institute of Technology. During the Chicago Exposition he was president of the jury of mines and mining, and has been a member of a like jury at the Paris Expositions of 1889 and 1900.

Dr. Howe was a Chevalier of the Legion of Honor, knight with star of the First Order of St. Stanislaus. He was also a member of the Century, Harvard and Technology clubs.

He is survived by his widow Mrs. Fanny Gay Howe.

JOHN H. PATTERSON

John H. Patterson, former president of the National Cash Register Company, of Dayton, Ohio, died on a Pennsylvania train passing through Kirkwood, N. J., on May 7, 1922, while on his way to Atlantic City. He was nearly 78 years old. He was born in Dayton, Ohio, on December 13, 1844. After attending the public schools in Dayton he went first to Miami University, and then Dartmouth College, where he was graduated in 1867. He served in the Civil War in the 131st Ohio Volunteers. In early life he was also a tool collector on the Miami and Erie Canal.

About 1870 he joined his brother, Frank J. Patterson, in the development of coal and iron mines in Jackson County, Ohio, and was general manager of the Southern Coal and Iron Company at Coalton. One of the interests of this company was a "company store," and it was there that Mr. Patterson saw the possibilities of the cash register. The store had been losing money, and upon reading of the new invention he purchased two machines from the inventors, John and James Ritty. The success with which the machine changed the losses of the store into profits prompted the two Patterson brothers to buy stock in the National Manufacturing Company, and two years later, in 1884, they acquired control.

Mr. Patterson became well known as a philanthropist during Dayton flood of 1913, when he spent much money and effort to relieve the suffering, for which he was highly commended by General Wood, the official in charge of relief work.

Though Mr. Patterson resigned as president of the National Cash Register Company a year ago, he had retained his connections with the concern as chairman of the board of directors.

NEWS OF THE INDUSTRY

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

JUNE 5, 1922.

Although the Brass City has not fully returned to a pre-war status from a metal industry standpoint, the consensus of opinion of the leading brass manufacturers is that it is gradually returning to that basis. The difficulty of the manufacturers at present is in the readjustment of the standards of wages to coordinate with the costs of materials manufactured here. Despite the fact that the wages of labor are higher than before the war, the manufacturers state that they receive approximately the same prices for their commodities that they received in that period. This situation, according to opinion, must be adjusted before a return to normalcy can be experienced.

The advancement of the radio activities has helped the brass business here during the past few months. Large orders for radio parts have been received by the **Scovill Manufacturing Company**, the **Steele & Johnson Company**, the **Novelty Manufacturing Company** and the **Bristol Company**. Many local plants are receiving large orders from foreign countries, particularly from South America, but a reasonable profit is not being realized, according to the manufacturers. This is due somewhat to the standards of exchange, long term credit specifications and the high standards of wages as compared with the normal cost of goods.

Another cause of worry to local brass manufacturers is the low tariff rates now in effect. When asked if his company received many foreign orders of late, **Ralph H. Smith**, vice-president of the **Randolph-Clowes Company**, and president and treasurer of the Smith & Griggs Company, said, "We are trying to beat the Germans in matters pertaining to foreign markets. It is a well known fact," he said, "that brass goods are imported into the United States and sold here at lower rates than American manufacturers can afford to make them for. Also, many foreign countries that formerly purchased American goods are turning to the cheaper German makes."

John H. Goss, vice-president of the **Scovill Manufacturing Company**, stated that his concern is undergoing a slow, gradual recovery, that is not startling, and that no foreign orders of any account had been received of late.

Fred S. Chase, of the **Chase Companies**, was optimistic about present conditions and declared that the present volume is distinctly greater than the amount of business last year. His complaint was that brass products are being sold below cost, which complaint, he said, was that of brass manufacturers all over the country. Nevertheless, he said, he believed the Chase Companies would come through without any losses if business kept to its present plan.

Irving H. Chase, president of the **Waterbury Clock Company** and the **Waterbury Watch Company**, was quite hopeful of business improving. "At present," he said, "the merger of the Ingersoll Watch Company with the Clock Company is taking place and considerable of the Ingersoll stock taken over, must be marketed before any thought can be given to opening the local branch of the watch company."

The **Noera Manufacturing Company**, which specializes in brass novelties is working full time and is on an 80 per cent employment basis, according to Frank P. Noera, its president and treasurer. He said his concern was kept busy filling orders for South American countries.

The buckle business is experiencing a slump, according to **Archer Smith**, president of the **American Mills Company** and the **Waterbury Buckle Company**, who declared that in his opinion business was not improving, because of the low cost of imported goods.

The **Eastern Brass & Ingot Corporation**, is in the hands of G. E. Dalbey, recently appointed receiver. Mr. Dalbey, formerly the metallurgist at the factory, is now conducting an inventory of the plant. The factory, located at Brown's Meadows, specialized in the melting of scrap brass into a compound from which bricks were made. Notices of the appointment of a receiver have been sent out and a hearing on the case will be held soon. Howard Baker was president of the corporation, Otto C. Duryet, vice-president, and W. S. Lord, secretary and treasurer.

A report that Waterbury mills of the American Brass Company are rolling between 20,000 and 30,000 pounds of copper stock per week, for copper shingle production by the Anaconda Copper Mining Comany, and that the local company had received orders from Anaconda for several million pounds of rolled copper for use in producing shingles, could not be verified in this city. An official of the company admitted that the matter was in an embryonic state at present. The report was to the effect that the order from Anaconda called for copper strips, 12 inches wide and .028 inches thick. The company is carrying on an extensive program to get copper shingles strongly entrenched in the roofing trade, and John D. Ryan has written the stockholders, asking their co-operation.

The **Lux Clock Company** has a device to turn money into time, a recently patented timepiece, called a coin clock, that is being made for several of the leading financial houses of the country, and which is expected to do away with the small savings banks distributed to the public by banks in every city. The clock required that a coin be inserted every 24 hours in order to run. Only nickels, dimes or quarters can be inserted and slots are made for these respective coins. There is also a small opening in the casing for the insertion of bills. The clocks will not be sold to the general public, but to banking houses and insurance companies. They will be let out to the public, but the keys necessary for opening them will be kept by the banks, and whenever the clock is filled, it must be brought to the bank and its contents deposited.

Trowbridge & Livingston, New York architects, have received the contract for drawing plans of a two-story, 70 x 250 foot, reinforced construction brick and steel addition to the **American Brass Company's** office building at the corner of Grand and Meadow streets. The addition will be similar in appearance to the present building and will contain almost as many offices.—W. R. B.

BRIDGEPORT, CONN.

JUNE 5, 1922.

Through a new first mortgage bond issue of 6 per cent, the **Remington Arms Company** has acquired a loan of $8,500,000 and will have available approximately $4,025,000 for the purchase of additional buildings, which they now lease from the government, and for the purchase of new equipment. The company's output of firearms and ammunition constitute about one-third of the country's total production, and its output of pocket cutlery is the largest in the United States.

The Industrial Employment Survey Bulletin issued by the United States Employment Service of the Department of Labor, states that industrial conditions in the brass and allied industries here are slowly improving. Unemployment, however, is still general, although increased activity in building trades has relieved the situation somewhat. While some plants are entirely closed, part time prevails in most places and full time in a number.

Thomas J. Seward, F. E. Bankwits and **L. M. Hemenway**, prominently connected with wire manufacturing in this city, have organized a wire company known as the **Seward Wire Company** in Parkersburg, West Virginia, and have been elected, respectively, as president, vice-president and secretary-treasurer. With a capital of $200,000 the company has started the erection of a plant. The chamber of commerce of that place has guaranteed a subscription of the $125,000 issue of preferred stock. Mr. Seward and Mr. Bankwits will leave Bridgeport and make their homes in Parkersburg.

Plant facilities in Bridgeport manufacturing plants are sufficient to carry on an intelligent brass research work for the purpose of developing better products, William R. Webster, vice-president of the Bridgeport Brass Company, told the Engineers' Club here recently in an address on "Practical Brass Research." Research

could not be carried on on a par with the methods employed in large industries like those of the big corporations which spend large sums of money in investigations, he said, but local manufacturers have means at hand—sufficient engineering apparatus and materials—which can be employed in carrying on tests, the data of which will reveal what course must be taken to arrive at better manufacturing processes and the employment of the proper materials in getting the highest grade of perfection in finished products.

Jenkins Brothers plant has started a five day, 48 hour week, announced by C. V. Barrington, its vice-president, after a vote of its employees as to what running time they would prefer—six days or five days on a 48 hour week.

The long drawn-out legal fight between the **Ball & Roller Bearing Company** of New York against the **F. C. Sanford Manufacturing Company,** of this place, was settled this month when Judge Thomas filed a decision in favor of the local concern. The New York concern had brought suit for an injunction and accounting, claiming an infrigement of patents on rolling machines. The Bridgeport firm claimed non-infringement, because of prior patents and publications.

The **Connecticut Electric Manufacturing Company** won its case in the Appellate Division of the Superior Court of New York, brought by C. B. Richards & Co., New York bankers, to recover $12,000 and damages. In the lower courts the case, involving "trade acceptances," a form of draft negotiated in foreign trade transactions, was decided against the local firm. It involved the shipment of supplies from Bridgeport to Japan, the financial details being arranged through the New York firm.

The Manufacturers' Association has offered prizes to high school students who submit papers based on data secured on inspection trips of the local plants. The prizes consist of technical and scientific books, as the winners may desire, to the value of $20, $10 and $5.—W. R. B.

TORRINGTON, CONN.

June 5, 1922.

Charles J. Blout, until recently with the home sales department of the **Torrington Company,** has gone to Denver, where he will be in charge of the Colorado office.

A new metal products plant began operations in Torrington during the past month. The concern is the **Graham Manufacturing Company** and occupies about 5,000 square feet of floor space in the old needle shop opposite the railroad station, with office at 75 John street. The owners are **James H. Graham,** formerly superintendent of Torrington Company plants, and his brother, **Joseph Graham.**

Jules Kraus, who came East from San Francisco about a year ago, to become superintendent of the **Bantam Ball Bearing Company,** has given up his position with the latter concern and located in Torrington.

W. J. Cooke has given up his position with the foundry shipping department of the **Turner & Seymour Company** and engaged with a plant in Plainville.—J. H. T.

NEW BRITAIN, CONN.

June 5, 1922.

Conditions at the **American Hardware Corporation,** the **Stanley Works** and **Stanley Rule and Level Company, Landers, Frary & Clark, the North and Judd Manufacturing Company, Traut & Hine's** and almost all other local metal manufacturing concerns are now practically back to normal. This is true both as regards working schedules and number of employes. Only within the past two weeks the **Stanley Works,** in both the cold and hot rolled steel departments and the wrought steel butts departments, increased its working schedule from 40 and 45 hours per week to a full time 55-hour week. **Landers, Frary & Clark** has also added not only to its employes but also to its working schedule and this past week one of its largest departments went from a 45 to a 55 hour week. In all of the other factories men are working from 45 to 55 hours weekly and there seems to be plenty of business.

As yet, however, the recently reorganized **New Britain Machine Company** has failed to show any signs of rallying. The big concern is still operating with but a skeleton crew and orders, which are so badly needed, are not coming in with any great rapidity.

That conditions are materially improved, however, is seen by the action of the city in abolishing its free employment agency. This was discontinued the first of the month when Mayor A. M. Paonessa, after a survey of the factories, decided it was no longer necessary.—H. R. J.

ROCHESTER, N. Y.

June 5, 1922.

The month just closing has been more or less of a disappointment to those connected with the metal industries. But few concerns about the city report business equal to that of March or April, and many fear that rejuvenation is a long way off. Not a foundry in Rochester, specializing in non-ferrous metals, is employing to exceed half its usual quota of help. One brass and aluminum plant has been fairly busy with orders from the **Taylor Instrument Companies.** The latter concern has been gradually returning to normalcy during the past year, and is one of the very few plants in Rochester that shows steady and satisfactory business improvement.

The **Rochester Can Company** has absorbed the plant of the **Menzies Street Cleaner Company** at Amsterdam, N. Y. This concern requires much brass, nickel, aluminum and copper in the finishing of its product. The entire plant will be removed to Rochester and housed in the Can Company's Hague street premises so soon as the space can be provided. At the present time the Can Company is taxed to its full capacity in the manufacture of metalware.—G. B. E.

TRENTON, N. J.

June 5, 1922.

Definite evidence of improvement in employment conditions in the Trenton manufacturing plants is shown in a study of industries by the Trenton Chamber of Commerce. The low mark was reached last December and since then has been increasing. This study is carried out in connection with a nation-wide review under the auspices of the United States Department of Labor.

Robert K. Bowman, of the **Jordan L. Mott Company,** says that orders on the books of his company are now from 40 to 50 per cent heavier than they were a year ago. Building is always regarded as a basic industry in this country and is usually an indicator of conditions in other lines. Practically the whole of the Mott output goes into building. Operations at the big Westinghouse Lamp plant have advanced from a four-day to a full week basis and an employment gain of more than 20 per cent registered. About 350 hands are now employed there and orders are coming in greater volume.

The **John A. Roebling's Sons Company, Westinghouse Lamp Company, J. L. Mott Company** and other metal industries in Trenton have become affiliated with the Workingmen's Safety and Sanitation Council recently organized at Trenton by the State Department of Labor. The object of the organization is to increase interest among industrial employes for better safety and sanitation in their various lines of endeavor.

Horland Company, Newark, N. J., has been incorporated at Trenton to deal in jewelry and silverware.

Hyman E. Gothberg Manufacturing Company, of Kenilworth, N. J., has been incorporated at Trenton with $200,000 capital to deal in electrical fixtures.

F. W. Giese and **Samuel Sica** have purchased the plant of the **American Plating Company,** 130 Washington street, Trenton, N. J., and will hereafter operate the same as the **Reliable Plating Company,** platers of nickel, brass, copper, bronze, black nickel and copper oxidized.

The plant of the **United Lead Company,** Perth Amboy, N. J., was recently badly damaged by flames. The blaze wiped out the white lead department.

The **Trenton Emblem Company** has completed the erection of a new foundry building, 36 by 77 feet, at the plant on Hamilton avenue. The company reports business very good and is working two shifts daily and Sunday. The company recently erected a recreation room for its employes, and also special wash rooms.

The stock in the **Turner White Metal Company** owned by John S. Turner, late of Highland Park, N. J., has been left in equal shares to his four children under a will which has been admitted to probate at New Brunswick. His estate was left to his widow.

Fischer-Sweeny Bronze Company, 312 Adams street, Hoboken, N. J., contemplates the erection of a two-story concrete and brick plant, 100 by 200 feet, to cost $80,000.—C. A. L.

CLEVELAND, OHIO

JUNE 5, 1922.

Striking improvement in the activity of automobile factories in the Cleveland district is the outstanding feature of the month, according to the recently issued Chamber of Commerce report. The increase in employment in this line was 12.6 per cent. For some unaccountable reason the metal and metal products industries, other than steel and iron, showed a slight decrease.

The machinery manufacturers' exhibit, held in the sales rooms of the Cleveland Tool and Supply Company attracted nation-wide attention and was visited by interests from all over the country.

The **Cox Brass Manufacturing Company** has leased 4,500 square feet of floor space at 79th Street and Woodland avenue for a period of years to serve as an addition to the Carnegie avenue plant. The space was formerly utilized by the **National Bronze and Aluminum Manufacturing Company.**

The **National Bronze and Aluminum Company** will erect a factory building at East 88th street and Leisy avenue. The cost will be around $40,000. The structure will be a single store affair and will have a ground spread of 20 x 150 feet.

Marked improvement among subsidiaries of the **Standard Parts Company** has been announced. The **Standard Welding Company,** the rim and tube division, reports 36 new accounts and a corresponding increase in shipments and orders. The **Eaton Axle Company,** the **Perfection Spring Company,** and the **Bock Bearing Company,** report similar gains.—C. C. C.

DETROIT, MICH.

JUNE 5, 1922.

Business conditions in all lines, especially brass, copper and aluminum, have steadily improved all through the month. In fact they are reported this week rapidly approaching the period of three years ago. Manufacturers already are bidding for labor and in most places unskilled mechanics are drawing from 50 to 60 cents an hour.

Skilled men are hard to get, the result being that employers are beginning to take on those from outside the city. In fact, there is a real sized boom on here in Detroit, but how long it will continued is another question. The automobile plants are all running heavily. The **Ford Motor Company,** the largest, is working nearly 60,000 in day and night shifts. The **Studebaker** plant also is working full capacity. The same is reported for the **Paige Motor Company,** the **Hudson Motor Company,** the **Cadillac Motor Car Company,** the **Ford Tractor** plant on the River Rouge just at the city limits; and likewise many of the smaller concerns report increasing business.

Scores of accessory plants in all parts of the city are running heavily and probably will continue as long as the general automobile business remains so favorable. Manufacturers of plumbers' supplies and building hardware also report a decided change for the better. This line has been severely effected for many months, the present being its first bright period since the close of the war.

While manufacturers are buying quite briskly for the time, it need not be expected they are going to stock heavily. The old policy of hand-to-mouth buying adopted a year or so ago, still is in vogue. Too many were caught with big stocks at the start of the slump to expect anything more than caution for a good many years.—F. J. H.

INDIANAPOLIS, IND.

JUNE 5, 1922.

The employees of the **Indiana Aluminum Ware Company,** at Elkhart, Ind., more than 150 of them, held their second annual banquet recently.

The **Elwood Brass and Aluminum Manufacturing Company** was organized at Elwood, Ind., recently with a capital stock of $20,000 to manufacture articles from brass, aluminum, copper, etc.

The **Terre Haute Bronze and Brass Foundry** is filling a long-felt want at Terre Haute, Ind., where there are so many coal mines, by the manufacturing of acid-resisting bronze pump liners.

Frederick S. Robinson, general manager of the **Midwest Engine Company,** has been appointed receiver for the **Byram Foundry Company** at Indianapolis by Judge Harry C. Chamberlin of Circuit Court on petition of Rufus Swain. The petitioner says the company owes him $4,454 on unpaid notes. The petitioner alleges that in addition to the obligations which the company owes him, it is in debt approximately $120,000 divided as follows: Approximately $60,000 to banks, about $30,000 to other foundries, and about $30,000 in other debts. It was shown that the company had on file orders for immediate delivery amounting to about $8,500 and orders for future delivery approximately $6,500. Total assets of the company were shown to be about $60,000.—E. B.

MONTREAL, CANADA

JUNE 5, 1922.

There are slight indications of a gradual resumption of activity in the non-ferrous manufacturing lines. One of these indications is that some fair-sized orders have been placed by jobbers for brass plumbing, heating and builders' brass goods. Montreal jobbers and manufacturers of plumbing supplies report that the general demand is heavier than for years as a result of the heavy building movement.

W. R. Cuthbert & Company, 37 Duke street, manufacturers of brass plumbing supplies, are now running to their full capacity.

Rolling stock can now be purchased at from 25 to 35 per cent less than peak prices and the contracts placed for locomotives and cars during March and April are providing substantial employment for several shops in this field.—P. W. B.

BIRMINGHAM, ENGLAND

MAY 19, 1922.

Orders in the brass trade, as in all other trades, continues to be of small bulk, though quantities now show a tendency to increase and the course of business is less fluctuating. The tube and sheet mills are least employed, export business being very slow, but latterly a few home railway contracts have provided a little additional employment. Much interest has been aroused by a departure taken by a Birmingham brass foundry firm in the substitution of hot stampings for castings in the manufacture of brass taps and stopcocks. Two or three other firms have taken up the process and already some large orders have been obtained. It is claimed that not only is the manufacture cheapened by the employment of unskilled labor in place of highly paid foundrymen, but also that the articles produced are superior in strength and soundness to cast work.

Electroplaters are still very poorly employed, but, together with the jewelers, they see signs of an improvement in business. The increase, in both cases, such as it has been so far, being mostly in the cheaper lines. Great progress has been made under the leadership of the **Birmingham Jewelers' & Silversmiths' Association** in the establishment by means of trade agreements of Standard's definitions for rolled gold and other articles for which no official assay is provided. It is hoped by this means to set up in regard to cheap gold and silver and imitation jewelry, including imitation stones, trade customs which, even if they should not be embodied in legislation, will in time come to have the force of law.

The **Foundry Trades Exhibition** which will be held in Bingley Hall, Birmingham, England, in the week commencing Monday, June 19, promises to be an occasion of great interest. It will be associated with the Annual Convention of the Institution of British Foundrymen.

On the Tuesday, H. R. H. the Duke of York, second son of the King, who has distinguished himself by his interest in British trade and commerce, will visit the Exhibition. About a hundred firms, including about eighty British firms and

representatives of the foundry industry in America, France and Belgium, have taken space, and a number of foreign visitors, among them M. Ronceray, of the famous French foundry, are expected. The non-ferrous side of the industry will be well represented. There will be some interesting illustrations of aluminium casting and a variety of melting furnaces for the non-ferrous trades. The **Morgan Crucible Company** will show the latest type of electrical melting furnace. Papers will be read not only in the Foundrymen's Convention but also at the Exhibition, among them one by **A. J. G. Smout**, Elliott Metal Company, Limited, on Brass Casting, and one by **Dr. J. G. Primrose**, on Aluminium Work.

Hopes of a settlement of the dispute in the engineering trades were strongly revived this week. For the first time since the lock-out was extended to members of the 47 allied unions, the Amalgamated Engineering Union consented to be represented in conference with the National Employers' Federations. But these hopes have been dashed recently. The A. E. U. representatives yesterday intimated that they cannot continue to negotiate on the basis of the employers' present terms.

The renewal of the negotiations was brought about on the suggestion of Sir William Mackenzie, who was appointed by the Government to preside at an Inquiry held under the Industrial Courts Act a fortnight ago. After sitting for two or three days he suggested that the parties should get together and closed the Inquiry, finding that the proceedings were resolving themselves into recriminations which tended to intensify ill feeling.

The final opinion expressed by Sir William is that "the matter is one in which no agreement, however carefully devised, can take the place of good sense and good will between the parties and the appreciation by either side of the difficulties and point of view of the other."

In the statement issued by the Amalgamated Engineering Union at the beginning of the dispute it was declared that "the only so-called managerial function which the men challenge is the right of the employers to determine whether or no the men shall work overtime on ordinary production work." This statement was not accepted by the employers, and in the course of the negotiations it became clear that the employers were contending for a freedom in managerial control which the unions at various points contested.

The principal points in the employers' present proposals are:

"In the case of alteration in working conditions that would result in a general displacement of one class of workpeople by another, the management should . . . give the workpeople concerned not less than ten days' notice of their intention, and afford opportunity for discussion.

"If there is a discussion and no agreement results, the management should give a decision upon which work should proceed pending recognized procedure being carried out.

"Where any class of workpeople are displaced, the management should consider the matter of affording suitable work for them.

"Questions in which the displacement of any class is not involved should be dealt with in accordance with the Provisions for Avoiding Disputes, and work proceed in the meantime following the act of the management."

The representatives of the other unions have asked for an opportunity to consult their Executives and the Conference has been adjourned. Whether the A. E. U. will be further represented is doubtful. It is thought possible that there will be a definite break between the A. E. U. and the other unions. The craftsman, says one of the leaders of the latter, is against the exercise of managerial rights by the employers because he fears that the laborer might have a chance of "getting away from the floor."

Business Items — Verified

The new address of the **F. A. Coleman Company** is 6539 Metta avenue, Cleveland, O.

Haldeman and Sons, Wrightsville, Pa., is a company recently established, to do brass, bronze and aluminum founding, by James Haldeman, formerly of York, Pa.

The **New York Brass Foundry Company,** 405 Broome street, New York, has increased its capital from $10,000 to $50,000. This company operates a brass and bronze foundry, and brass machine shop.

The **F. A. Coleman Company,** engineers and manufacturers of foundry equipment, has removed their office and works from 1951 East Fifty-seventh street to 6539 Metta avenue, Cleveland, Ohio.

The **Metal and Thermit Corporation,** 120 Broadway, New York, announces the removal of its Pittsburgh branch office from 1427 Western avenue to 801-807 Hillsboro street, Corliss Station, Pittsburgh, Pa.

The **General Chemical Company** of Philadelphia, has recently purchased a 4½-foot diameter by 16-inch cylinder Hardinge conical ball mill, for treating their zinc skimmings preparatory to reclaiming this metal.

The **Pryibil-Genzlinges Machine Company,** New York, has purchased the plant and equipment of the Archbold-Clement Company, silverware manufacturers, Newark, N. J., and will offer it for sale as a whole.

The **White Foundry Company,** Roanoke, Va., is making a list of equipment for its new one-story foundry. H. H. White, 613 Tenth avenue, S. E., is president. They operate a brass, bronze and aluminum foundry.

The **Stamford Rolling Mills Company,** Springdale, Conn., manufacturers of non-ferrous metal sheets, has changed its New York address to 347 Madison avenue. They operate a casting shop, rolling mill, and tinning department.

The **National Bronze and Aluminum Foundry Company,** Cleveland, Ohio, are building a 150 feet addition to their new plant at East 88th street and Laisy avenue, and at the present time are in the market for a few molding machines and some miscellaneous foundry equipment.

The **Ajax Electrothermic Corporation,** Trenton, N. J., recently sold to the Dentists' Supply Company, of New York, at York, Pa., a 25 K. V. A. high frequency converter, with two furnaces and a vacuum attachment. These furnaces will be used for laboratory melting of precious metals and alloys.

The **American Supply Company,** 135 Washington street, Providence, R. I., has been appointed agent for the Providence district to represent the Quigley Furnace Specialties Company of New York, manufacturers of Hytempite. The Quigley products are warehoused in Providence for quick delivery to local points.

The **Lomar Manufacturing Company,** Middletown, Ohio, manufacturer of the celebrated Lomar shock absorber, has been incorporated in Ohio for $100,000, all common stock. The officials are: C. W. Shartle, Jr., president and general manager; Thomas Randolph, vice-president and director; L. L. Lomar, general superintendent.

A new corporation has been formed at Ogdensburg, N. Y., for the purpose of manufacturing metal articles by **Harry T. Barnwell,** formerly president of the Barnwell Manufacturing Company, of Freeport, Ill., and **Edgar J. Boyer,** of the National Bank of Ogdensburg, with a capital of $50,000. They intend to locate their factory in the Middle West.

A suit has been brought against the **Cutler-Hammer Manufacturing Company** alleging infringement of Abbott patent No. 1,367,341, covering what is known as sheath wire. The bill of complaint was filed in Milwaukee on February 21, 1922. The complainants in the case are the **General Electric Company** and the **Edison Electric Appliance Company.**

The **Pryibil-Genzlinger Machine Company,** makers of ball-bearing metal spinning lathes, tools and accessories, back centers, oval chucks, trimming and beading attachments and band and circular saw machines for metal, buffers' and spinners' tools and supplies, have opened an office at 207-A Herald building, Broadway and Thirty-sixth street, New York.

The **Cox Brass Manufacturing Company,** Cleveland, Ohio, has leased 4,500 square feet of floor space at 79th and Woodland

streets for a period of years. The space was formerly occupied by the National Bronze and Aluminum Foundry Company. The Cox Brass Manufacturing Company has another plant on Carnegie avenue. They operate a grinding room, plating, polishing and japanning departments.

The **Dodge Sales and Engineering Company,** Mishawaka, Ind., manufacturers of power transmission appliances and heavy oil engines, announce the removal of their New York City branch from 21 Murray street to the new Dodge building, located at the corner of Park Place, W. Broadway and Murray streets, known as 53 Park Place. The new building is twelve stories high and is of steel and concrete construction and modern in every detail.

The **Cincinnati Galvanizing Company,** McMicken avenue and Straight street, Cincinnati, Ohio, has bought a building at Third and Eggleston avenues, which they intend to use as a power plant for the time being. It is a strictly modern building of four floors and basement, with approximately 70,000 square feet, and has a Pennsylvania Railroad siding. They desire to lease it out at present. They state it is suited for sheet metal manufacturing or plating, etc.

On May 1st the New York offices of the **American-La France Fire Engine Company, Inc.,** and of S. F. Hayward & Co., their subsidiary, were moved from their old location at 250 West 54th street to the new Fisk building on 57th street, between Broadway and Seventh avenue. These new offices, which take up most of the 22nd floor, occupy a floor space of five thousand square feet, and afford ample quarters for the growing activities of these concerns.

The **Jewelers' Casting Company,** Attleboro, Mass., was established by E. Owren and R. L. Keith, the former of whom was formerly connected with the Owren Casting Company, of that city, in February of this year. They do casting for jewelers and silversmiths, aiming to produce the best castings obtainable in French sand by the plaster process. They make a specialty of bronze moulds, dies and forcers, and also of very fine portrait work and plaques. They report that business is good.

The **Scientific Metal Products Company,** Chicago, Ill., recently incorporated with $10,000 capital stock, has leased a plant at 658-660 West Division street, with a floor space of 2,500 square feet. They manufacture surgical instruments and appliances, tools, dies, special machinery, etc. The officers are: Frank Nemec, president; Richard Preiss, vice-president; George M. Skubella, secretary and treasurer. The company operates a brass machine shop, tool room, casting shop, and plating and polishing departments.

Frank Holton and Company, Elkhorn, Wis., manufacturers of band instruments, brass specialties, etc., have had plans prepared by Martin Tullgren & Sons, Milwaukee, for a two-story addition, 40 x 80 feet, of brick and mill construction, of which the estimated cost, with equipment, is about $45,000. Inquiry is now being made for tools and other supplies. This firm operates a brass machine shop, tool room, grinding room, cutting-up shop, and spinning, stamping, brazing, soldering, plating, polishing and lacquering departments.

The **Precision Castings Company, Inc.,** Syracuse, N. Y., recently in the hands of a receiver, has been completely reorganized with the following men as officers: Frank E. Wade, president (also vice-president of the American Piano Company); F. P. Assmann, chairman of the board of directors (also vice-president of the Continental Can Company); J. W. Knapp, vice-president; H. W. Smith, secretary and treasurer (also vice-president and treasurer of L. C. Smith Brothers Typewriter Company). The new company is amply financed, and ready to take care of wants in the die-casting line. Financial statements will be furnished by Dun's, Bradstreet's and other agencies.

The **Eureka Pneumatic Spray Company,** 62-64 Ninth avenue, New York City, announces that on or about July 1, it will move to a new factory building, located at 130th street and Jamaica avenue, Queens Borough.

The building will be occupied entirely by the Eureka Pneumatic Spray Company, which has started to manufacture its own line of exhaust wheels, and will, in addition to uses for spray booths, cater to the general field in this line.

They are turning out a new line of exhaust wheels, equipped with roller bearings and special lubricating arrangement, both in belt-driven and motor-driven types.

GENERAL ELECTRIC COMPANY CHANGES

Following a meeting of the board of directors of the **General Electric Company,** held in New York, May 16, C. A. Coffin retired as chairman and was succeeded by Owen D. Young, long associated with the company as vice-president. The position of president was filled by the election of Gerard Swope, president of the International General Electric Company, succeeding E. W. Rice, Jr., who requested to be allowed to devote his entire energies to the further upbuilding of the scientific, engineering and technical phases of the company's work in the broadest sense, and who will become honorary chairman of the board of directors. Anson W. Burchard, for many years identified with the company as vice-president, with particular reference to public utilities and foreign investment, was elected vice-chairman of the board. J. R. Lovejoy, vice-president in charge of sales, was elected a director, as was also G. F. Morrison, vice-president. Particular significance is attached to the action of the board of directors in the creation of the position of honorary chairman, which will be filled by Mr. Rice for the purpose of extending G-E service.

BRITISH AMERICA NICKEL CORPORATION

The British America Nickel Corporation, Ltd., has entered the American field. The mine and smelter plants are near Sudbury, Ontario, and the refinery near Ottawa, Quebec. They are said to be large modern plants, capable of turning out a large and steady tonnage of excellent quality nickel. It is also stated that the corporation has large reserves of ore and will operate for many years, thus assuring its customers of a continuous supply of metal. Sixteen million tons of ore; sufficient to keep the present plant running for 30 years, are said to have been developed, so far, with the likelihood that the ore body extends much further than the present explorations show.

The mine and smelter are equipped completely throughout; power is supplied by a plant capable of generating 6,000 H. P. The smelter building includes two large blast furnaces with a third projected. These furnaces have a capacity of from 800 to 1,000 tons of ore per day. In addition there are three basic lined converters with the necessary traveling cranes, ladles, etc., to serve them.

The plants are connected by rail with the Canadian Pacific and the Algoma Eastern Railways, giving them excellent transportation facilities. The refinery, it is stated, has a capacity of about 7,500 tons of nickel per year, employing the Hybinette electrolytic process for the refinery of nickel, copper and precious metals; provision for increase has been made. In addition there is a power sub-station and a reserve power generating capacity of 2,000 H. P. from Babcock and Wilcox boilers.

The nickel is sold in the form of sheet cathodes about 24"x36" and varying from 1-16" to ¼" in width. The Corporation states that this metal contains less than .8 per cent contaminating impurities and that the nickel content (cobalt included) is not less than 98.5 per cent. Nickel can be obtained in the form of either small cut sheets to be used in the smaller melting units or in larger sizes usually bound in 25 to 50 pound bundles. It is stated, however, that shipment can be made in shapes and sizes up to 24"x36" to meet any requirements.

The Corporation has a particularly strong Board of Directors. The men representing the Norwegian interests are men of the very highest standing in the Norwegian business world. The London director is Sir Eric Hambro, an outstanding man in London financial circles. The New York representative is E. A. Cappellen Smith, who is so well known in the copper industry in the United States. The Canadian directors contain such well known names as Sir Robt. Borden, for many years Prime Minister of Canada; J. Fred Booth, one of the largest Canadian lumber operators, and E. R. Wood, who has been identified with large financial enterprises in Toronto for many years.

METAL SEA PLANE FOR NAVY

Secretary Denby of the Navy Department authorized, on May 7, 1922, an announcement that the Glenn L. Martin Company of Cleveland, Ohio, has undertaken the development for the Naval Bureau of Aeronautics of a number of seaplanes to be constructed of duralumin, a special alloy of metal, and to be used by the fleet for spotting gunfire at long ranges.

The development of metal aircraft construction in the United States, Secretary Denby said, has been made possible by the Navy Department in that the special alloy metal, duralumin, originally developed in Germany, has been introduced to American manufacturers in connection with the construction of the rigid airship ZR-1 at the naval aircraft factory at Philadelphia. This work has now progressed to the point, according to naval aviation experts, where duralumin of proper quantity, and in all of the useful shapes, is now available to any aircraft builder from at least two American commercial sources. The naval aircraft factory at Philadelphia has also developed special machinery and processes for its fabrication.

Secretary Denby said that the Stout Engineering Laboratories, Inc., of Detroit, were also working with duralumin. This firm has received a contract from the Navy Department for the construction of experimental torpedo-carrying seaplanes to be built entirely of metal, and a simple machine of this character is now under trial flights. Other manufacturers in work for the Navy, it was disclosed, have employed duralumin for parts of airplanes with success, notably the Galaudet Aircraft Corporation of Providence, R. I., and the Aeromarine Plane and Motor Company of Keyport, N. J.—N. Y. Times, May 8, 1922.

LARGEST ORDER FOR COPPER WIRE

The largest single order for copper wire ever placed in the world was given some time ago by the Pacific Gas & Electric Company.

The order calls for the delivery of **10,000,000 pounds of copper wire.**

The shipment of the copper wire from Black Eagle, Montana to the Pacific Gas & Electric Company will require the utilization of 270 railroad cars, or ten freight trains of average size.

Up to the consummation of this order, the record order for copper wire was that of the Chicago, Milwaukee & St. Paul Railway, which called for 7,000,000 pounds. This wire was used some years ago in the construction of the Puget Sound extension of the St. Paul system, which was electrically operated.

TRADE PUBLICATIONS

Instructions for Installing and Operating Standard Radial Blast Sand Blast Barrels.—A booklet issued by the Standard Equipment Company, New Haven, Conn., containing instructions for setting-up and operating their radial blast sand blasts, with illustrations.

Standard Radial Blast Sand Blast Barrels.—A booklet issued by the Standard Equipment Company, New Haven, Conn., describing and illustrating their radial blast barrels.

Madsenell Laboratory Products.—A booklet issued by the Madsen Laboratories, 33 East 17th Street, New York City, describing the properties of the new electrolytic nickel produced by the Madsenell process, and also the process itself. It also describes the different forms in which Madsenell nickel is used, such as sheet nickel, coatings and duplex metal, and its use in galvanoplasty. It also gives information about the licenses granted by the Madsen Laboratories to manufacturers.

Copper Exposition.—A booklet issued by the Great Falls Commercial Club, Great Falls, Montana, who have established an exhibit of products made from copper and zinc.

K. & S. Thermo-Electric Remote Control Thermometers and Pyrometers.—A folder issued by the Arthur Sachsse Corporation, 6 West 32d Street, New York, describing and illustrating their imported thermometers, and pyrometers which are made for various ranges of temperature from minus 250 degrees to plus 1600 degrees centigrade, and are made in indicator and recorder types.

Stationary and Tilting Crucible Melting Furnaces.—A folder issued by the W. S. Rockwell Company, 50 Church Street, New York, describing and illustrating their pit and tilting furnaces, using oil or gas fuel, for melting all kinds of non-ferrous metals and alloys.

Stevens Columbia Parting.—A folder issued by Frederic B. Stevens, Detroit, Mich., describing the properties of this parting compound.

Heat-Treatment Furnaces.—A catalogue issued by the W. S. Rockwell Company, 50 Church Street, New York, illustrating and describing various installations of furnaces of the stationary type, and practical methods of heating and handling, and containing a table of standard sizes of furnaces for carbonizing and heat-treating.

Anaconda Copper Roofings.—A booklet and folder describing Anaconda copper shingles, and giving information on the laying of roofs, accompanied by a blue-print sheet which illustrates in details the manner of application. Issued by the Anaconda Copper Company, 25 Broadway, New York.

Power Sand Cutting Machine Type HP.—A pamphlet issued by the American Foundry Equipment Company, 366 Madison Avenue, New York, describing and illustrating their new power molding sand cutter.

Thermalloy.—A catalogue issued by the Electro Alloys Company, Elyria, Ohio, describing and illustrating the nature, properties and uses of Thermalloy, a chromium alloy, for resisting high temperatures.

Leiman Brothers Sand Blasts.—A chart in the form of a folder issued by Leiman Brothers, 81 Walker Street, New York, describing and illustrating their various sand blast appliances.

BUSINESS TROUBLES

Elmer W. Demarest, referee in bankruptcy for the United States District Court, for the District of New Jersey, has issued an announcement that Andrew T. Fletcher, trustee in bankruptcy will sell at public auction on Tuesday, June 13, the property of the **New Jersey Tube Company,** situated at Harrison, N. J. The property consists of three tracts of land, the buildings located thereon, also, machinery, tools, supplies and a quantity of metals, viz. copper, brass, zinc, and office furniture, etc. On the 19th of June, at 75 Montgomery street, Jersey City, N. J., the trustee will present before the referee his report of the sale to the court.

COPPER AND BRASS RESEARCH

As a part of a nation-wide campaign designed to foster the use of more permanent materials in building, the Copper and Brass Research Association has announced a contest for school children and others, offering cash prizes for the best photographs showing the relative durability of materials which go into the construction of American homes.

Some idea of the cost to this country of the practice of building for speculative profit rather than for use is evidenced by the result of a statistical study just completed by the Copper and Brass Association. The fire loss on the 21,000,000 American homes, insured as they are for a total of $91,700,000,000, is about $35,000,000 a year, based on figures for 1918 to 1920, inclusive.

Fourteen prizes ranging from $150 to $10 will be awarded for photographs of copper and brass objects of utility or ornamentation which, to qualify, must have been in use more than 35 years. Included are copper roofs, brass door knockers, old copper cooking utensils, brass plumbing pipe. Fourteen additional prizes of similar amounts are offered for the best photograph showing the results of using substitutes for copper and brass.

Review of the Wrought Metal Market

WRITTEN FOR THE METAL INDUSTRY BY J. J. WHITEHEAD, WHITEHEAD METAL PRODUCTS COMPANY, NEW YORK

During the past month there has been a very substantial broadening of activity in the line of fabricated brass and copper materials, due to a very marked increase in the demand on the part of the consumers. There have been many factors that have entered into this, all of which contributed to make the turn-over exceptionally large.

Many of the brass and copper mills are now from six to ten weeks behind on their orders, and have on their books

a larger volume of business than has been in hand for any time during the past few years.

There has also been a rise in the price of Ingot Copper on which sales have been exceptionally large. The upward tendency has colored the entire industry and for some time past there has been a feeling of optimism. Most of the mills which during a long period have been operating at a loss now have substantial amounts of business at prices which will insure them a moderate profit, and the cut-throat policy which has prevailed during the past lean months has been practically abandoned.

It is recognized, of course, that a great deal of the activity is due to the enormous amount of material being consumed by the automobile industry and the building trades together with the revival of many lines that have for some time past been dormant. There seems to be no question that the greatest factor of all has been the automobile trade, the development of which has been phenomenal. This, of course, has carried with it the consumption of non-ferrous metals in the shape of automobile accessories and parts.

The demand for copper and brass materials from the building trade lends considerable color to the feeling that the efforts of the Copper and Brass Research Association have been productive of a considerable amount of good. There is no question that there has been a widespread revival of interest in copper roofing material and brass plumbing material on the part of home-builders and the low prices at which these various articles may be secured has been responsible for a considerable volume of sales to this trade.

It is estimated that the sales of copper conductor pipe, for example, have been larger than at any previous time in the history of the trade. This is just one indication of the manner in which copper is being adopted by the builders of houses, and shows to a considerable degree what can be done by way of developing a larger interest in the consumption of non-ferrous metals, when the price of products made from these metals is put on a level which places them within reach of the rank and file of the consumers.

Another large development in the non-ferrous metal trade, and a matter of considerable importance, is the opening of the new mill at Huntington, West Virginia, by the International Nickel Company, for the fabricating of Monel metal in its various forms, such as sheets and rods.

The indications are that this mill will be in full operation some time during the month of July, and it will, at that time, be possible to supply the industry with the various basic forms of Monel metal.

There has been in effect for the past year or more a very active campaign for the education of prospective Monel users, and the knowledge of the various purposes to which this metal can be advantageously applied is now becoming very general. In this line also there has been a recognition of the fact that the adoption of a price schedule on a basis that would prove attractive to the consumer is a desirable thing. To this end, and in anticipation of the lower cost schedule, the International Nickel Company on April 1st reduced the price on Monel metal sheets 10 cents per pound, and the rods 2 cents per pound.

The effect of this price reduction is only another indication of what may be done by way of developing the non-ferrous metal industry, particularly when the prices are placed on a level which makes it possible to apply these metals to general use.

Practically all of the controlling factors in the non-ferrous metal industry and particularly in the brass and copper line have felt for some time that if public interest were sufficiently aroused, the demand for articles made of non-ferrous metals must necessarily be increased.

All of the agitation conducted along these lines has seemed to have borne fruit, and it is very gratifying to note the fact that, taken as a whole, the entire industry is in a much healthier condition than it has been for a number of years past.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America	$100	$400	$450
American Hardware Corp.	100	177	181
Bristol Brass	25	13½	15
International Nickel, com.	25	18	18¼
International Nickel, pfd.	100	80	84
International Silver, com.	100	20	30
International Silver, pfd.	100	98	100
New Jersey Zinc	100	143	146
Rome Brass & Copper	100	98	104
Scovill Mfg. Co.	100	325	350
Yale & Towne Mfg. Co.	...	305	315

Corrected by J. K. Rice, Jr., & Co., 36 Wall Street, New York.

Metal Market Review

Written for The Metal Industry by METAL MAN

COPPER

Activity in the copper market increased greatly during May and prices registered decided gains for all positions. Buyers appeared more confident recently and the volume of trading expanded to such an extent that indicated a most healthy broadening out of consumption at all centers. Producers and smelters booked substantial orders on a steadily rising market. The soundness of underlying conditions and the continuous strength of the market has attracted a steady stream of orders for domestic distribution and export shipment.

June came in with the copper market firm on the electrolytic basis of 13⅞c@14c. Brass and copper manufactured products are in good demand, with encouraging prospects for improved trade in the summer and fall. Export shipments of copper since first of the year were specially encouraging. The domestic market advanced a full cent per pound during the month of May.

ZINC

Distinct signs of improvement in the zinc market were the feature during the past month. Prices stiffened up considerably within this period. Quotations advanced from 5 cents East St. Louis and 5.35 cents New York to 5.25c and 5.60c, respectively. Inquiries from domestic buyers developed on a good scale for May and June deliveries. There was also some buying by Japanese interests. Producers booked a fair amount of business, but as a rule refrained from pressing sales even at the higher market prices. There are further signs of a slight hardening of price as we go to press. The outlook is promising as consumption is getting on a sound and broader basis.

TIN

Conditions in the tin market the past month reflected considerable hesitation and general conservatism on the part of both dealers and consumers but experienced opinion in some quarters looks for a healthy trade condition in the near future that will give the market an upward push and bring buyers out in force.

The tin consuming industries are using a large tonnage every month. Actual seasonal demand should increase during the next six months unless curtailment in operations becomes necessary owing to shortage of coal supplies. Tin plate manufacturers and the canning interests are committed to a policy of expansion. The May closing was firm, with sales of spot tin at 31⅝c, which compares with 31⅛c at the beginning of the month. United States deliveries in May were 4,600 tons at Atlantic ports and 140 tons at Pacific ports, a total of 4,740 tons, as against total domestic deliveries in April of 4,995 tons. Stocks at end of May were 1,921 tons of which 771 tons were in warehouse and 1,150 tons at landing. The stocks on April 30th were 2,731 tons. The market closed firm on June 1st, at 31⅝c@31¾c for Straits for all deliveries up to August.

LEAD

Producers of lead still have decidedly the upper hand and are able to maintain a strong control of the market. The

heavy buying of a few weeks ago gave momentum and strength to the situation and has enabled sellers to hold prices at present high rates. Underlying conditions reflect a strong position for nearby shipments, but current prices should stimulate ore production in the various producing districts.

Consumption is maintained on a large scale, and this gives a sound foundation for a firm market. Nevertheless, there are incidental evidences that buyers realize that an advance of $19 per ton in about two and a half months is a signal to proceed with due caution in purchasing on present basis. Consumers, however, continue their interest in the market. The leading producer has advanced the price to 5.45c East St. Louis, and 5.65c New York. The outside market quotes 5.50c and 5.75c, respectively.

ALUMINUM

Moderate transactions in sheets and ingots marked the trading in the past month. Prices were maintained at the level of 20.10c for 99% metal and 19.10c for 98-99% virgin material as produced by the Aluminum Company. The outside market quotes 17.75c to 18c for 98-99% virgin and 16.75c@17.25c for 98-99% remelted quality. The motor industry continues to take substantial deliveries. Foreign offers are firm and at a shade higher than a short time ago.

ANTIMONY

Holders and importers marked up 99% regulus metal to 5¾@5½ cents, duty paid, in first half of May. Holders are more anxious to make sales, and with no urgent demand in sight the tone is decidedly easier. Import antimony is quiet, and spot regulus is 5.30c@5.40c.

QUICKSILVER

Quicksilver quotations maintain a steady tone at $56 to $57 per flask. There is a good prospective demand when importers are in better position to meet it. The proposed higher tariff restricts offerings. Recent arrivals were readily disposed of to the manufacturing trade. Further shipments are afloat from Italy, and more supplies are looked for from England and other foreign ports. Recent London quotations were £12 and Italian sellers named 27.50 lire. Local supplies are scarce, and spot quicksilver finds a ready sale.

SILVER

Developments during the past month were favorable to higher prices for silver both in London and New York. At the close of May the foreign product quoted 72¼c, against 68½c at beginning of the month. London bar silver was 36½d. per oz., as compared with 34⅞ d. on May 1st. World consumption of silver is greatly in excess of the yearly production. Any accelerated demand therefore finds the market extremely sensitive. American output will increase somewhat during the last half of this year, but from our knowledge and study of the situation, it would not be surprising to witness a broader and higher market in the next three months.

PLATINUM

Market for platinum holds steady at $85 an oz. Demand has been more active lately due to increased use by the jewelry trade. Authorities report amount of platinum used for various purposes as follows: Jewelry trade 57%, electrical industry 19%, dentistry 11%, chemistry 10%, and the miscellaneous uses account for 3%.

OLD METALS

A decidedly optimistic tone was apparent in the market for old metals, prices scoring further advances and the volume of trading increasing to a marked extent. At the close of month prices dealers were prepared to pay were quoted at 11½c@11¾c for strictly crucible copper, 10¾c@11c for uncrucibled copper, 5½c@6c for heavy brass, 7c@7½c for new brass clippings. No. 1 composition turnings 7c@7½c, cocks and faucets 6¾c@7¼c, new aluminum clippings 13½c@14c, old sheet aluminum 11c@11¾c, heavy lead 4¾c, new zinc scrap 3¼c@3¾c, and battery lead 2.50c@3.10c. These prices are liable to change from day to day, and with primary copper, lead and zinc so firm the upward trend of the market is likely to continue.

WATERBURY AVERAGE

Lake Copper—Average for 1920, 13.136. January, 1922, 13.875.—February, 13.375—March, 13.125—April, 13.00—May, 13.375.

Brass Mill Zinc—Average for 1920, 5.175—January, 1922, 5.25—February, 5.00—March, 5.10—April, 5.40—May, 5.55.

Daily Metal Prices for May, 1922

Date	1		3	4	5	8	9	10	11	12	15	16	17	18	19
Copper (f. o. b. N. Y.) c/lb.:															
Lake	13.00	13.00	13.25	13.25	13.25	13.25	13.25	13.25	13.25	13.25	13.25	13.25	13.375	13.375	13.50
Electrolytic	12.75	12.875	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.125	13.125	13.125	13.25	13.375	13.50
Casting	12.50	12.50	12.625	12.625	12.625	12.625	12.625	12.625	12.625	12.625	12.625	12.625	12.75	12.75	12.875
Zinc (f. o. b. St. L.) c/lb.:															
Prime Western	5.00	5.00	5.00	5.00	5.05	5.05	5.00	5.05	5.05	5.10	5.15	5.15	5.10	5.15	5.15
Brass Special	5.10	5.10	5.10	5.10	5.15	5.15	5.10	5.10	5.10	5.20	5.25	5.25	5.20	5.25	5.25
Tin (f. o. b. N. Y.) c/lb.:															
Straits	31.125	31.25	30.875	30.875	30.875	30.75	30.625	30.625	30.50	30.625	30.75	30.75	30.75	31.00	31.50
Pig—99%	30.375	30.50	30.125	30.125	30.125	30.125	29.875	29.875	29.75	29.875	30.125	29.875	30.00	30.25	30.75
Lead (f. o. b. St. L.) c/lb	5.25	5.20	5.20	5.15	5.10	5.15	5.15	5.15	5.15	5.15	5.20	5.25	5.25	5.375	5.50
Aluminum, c/lb	17.75	17.75	17.75	17.75	17.75	17.75	17.75	17.75	17.75	17.75	17.75	17.75	17.75	17.75	17.75
	20.10	20.10	20.10	20.10	20.10	20.10	20.10	20.10	20.10	20.10	20.10	20.10	20.10	20.10	20.10
Nickel, c/lb.:															
Ingot	36.00	36.00	36.00	36.00	36.00	36.00	36.00	29-36	29-36	29-36	29-36	29-36	29-36	29-36	29-36
Electrolytic	31-39	31-39	31-39	31-39	31-39	31-39	31-39	31-39	31-39	31-39	31-39	31-39	31-39	31-39	31-39
Antimony (Jap. and Chin.) c/lb	5.25	5.375	5.375	5.375	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50
Silver (foreign) c/oz	68.50	68.75	68.875	69.625	70.125	69.50	69.875	70.25	70.375	70.125	72.125	72.25	72.75	73.625	71.375
Platinum $/oz	85-90	85-90	85-90	85-90	85-90	85-90	85-90	85-90	85	85	85	85	85	85	85

Date	22	23	24	25	26	29	30	31	High	Low	Aver.	June 12
Copper (f. o. b. N. Y.) c/lb.:							HOLIDAY—DECORATION DAY					
Lake	13.75	13.875	13.875	13.875	14.00	14.00		14.00	14.00	13.00	13.460	14.00
Electrolytic	13.75	13.75	13.75	13.75	13.75	13.75		13.75	13.75	12.75	13.290	13.875
Casting	13.00	13.125	13.125	13.25	13.375	13.375		13.375	13.375	12.50	12.830	13.375
Zinc (f. o. b. St. L.) c/lb.:												
Prime Western	5.15	5.15	5.20	5.20	5.25	5.25		5.30	5.30	5.00	5.114	5.45
Brass Special	5.25	5.25	5.30	5.30	5.375	5.375		5.375	5.375	5.10	5.210	5.55
Tin (f. o. b. N. Y.) c/lb.:												
Straits	31.00	30.875	31.00	31.25	31.125	31.50		31.75	31.75	30.50	30.971	31.625
Pig—99%	30.125	30.00	30.25	30.375	30.375	30.625		30.75	30.75	29.75	30.193	30.75
Lead (f. o. b. St. L.) c/lb	5.50	5.50	5.50	5.50	5.50	5.50		5.50	5.50	5.10	5.306	5.65
Aluminum, c/lb	17.75	17.75	17.75	17.75	17.75	17.75		17.75	17.75	17.75	17.75	17.75
	20.10	20.10	20.10	20.10	20.10	20.10		20.10	20.10	20.10	20.10	20.10
Nickel, c/lb.:												
Ingot	29-36	29-36	29-36	29-36	29-36	29-36		29-36	29-36	29-36	29-36	29-36
Electrolytic	31-39	31-39	31-39	31-39	31-39	31-39		31-39	31-39	31-39	31-39	31-39
Antimony (Jap. and Chin.) c/lb	5.50	5.50	5.50	5.50	5.45	5.45		5.40	5.50	5.25	5.440	5.25
Silver (foreign) c/oz	73.75	72.75	72.125	72.25	72.25	71.875		72.25	73.75	68.50	71.131	71.50
Platinum $/oz	85	85	85	85	85	85		85	90	85	86.818	85

Metal Prices, June 12, 1922

INGOT METALS

Silicon Copper, 10%	according to quantity	34 to38
Phosphor Copper, guaranteed 15%	" " "	17 to26
Phosphor Copper, guaranteed 10%	" " "	16½to25½
Manganese Copper, 30%	" " "	50 to56
Phosphor Tin, guarantee 5%	" " "	35⅝to45⅝
Phosphor Tin, no guarantee	" " "	40 to50
Brass Ingot, Yellow	" " "	8¼to10½
Brass Ingots, Red	" " "	11¼to13
Bronze Ingot	" " "	11½to13¼
Parsons Manganese Bronze Ingots	" " "	16½to18
Manganese Bronze Castings	" " "	21 to33
Manganese Bronze Ingots	" " "	12 to15½
Manganese Bronze Forgings	" " "	30 to40
Phosphor Bronze	" " "	24 to30
Casting Aluminum Alloys	" " "	18 to21
Monel Metal	" " "	38
Manganese Metal—95-98% Mn., carbon free, per lb.		0.75
Magnesium Metal—Duty 20% ad valorem		$1.25-1.35
Bismuth—Duty free		2.00-2.10
Cadmium—Duty free		1.00-1.25
Chromium Metal—95-98% Cr., per lb. Cr. contained		1.50
Cobalt—97% pure		3.00-3.25
Quicksilver—Duty 10% per flask of 75 lbs		$55-$57

OLD METALS

Buying Prices		Selling Prices
11¼to11¾	Heavy Cut Copper	12½to12¾
11 to11½	Copper Wire	12¼to12½
10 to10¼	Light Copper	11 to11¼
8½to 9	Heavy Machine Comp	10 to10½
6¾to 7	Heavy Brass	8 to 8½
5½to 6	Light Brass	7 to 7¼
6¼to 6½	No. 1 Yellow Brass Turnings	7¼to 7½
7¾to 8½	No. 1 Comp. Turnings	9¼to10
4	Heavy Lead	4½
4	Zinc Scrap	4½
6 to 6½	Scrap Aluminum, Turnings	8 to 9
11½to12½	Scrap Aluminum, cast alloyed	13½to14½
14½to15½	Scrap Aluminum, sheet (new)	16½to17½
18½	No. 1 Pewter	22½
15	Old Nickel anodes	17
23 to25	Old Nickel	27 to29

BRASS MATERIAL—MILL SHIPMENTS

In effect June 1, 1922.

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.16¾	$0.18⅜	$0.19⅞
Wire	0.17¼	0.18⅞	0.20⅜
Rod	0.14¾	0.19⅜	0.20⅞
Brazed tubing	0.23⅝	......	0.28⅝
Open seam tubing	0.26⅝	......	0.28⅝
Angles and channels	0.26⅝	......	0.31⅝

To customers who buy less than 5,000 lbs. in one order.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.17¾	$0.19⅜	$0.20⅞
Wire	0.18¼	0.19⅞	0.21⅜
Rod	0.15¾	0.20⅜	0.21⅞
Brazed tubing	0.24⅝	......	0.29⅝
Open seam tubing	0.24⅝	......	0.29⅝
Angles and channels	0.27⅝	......	0.32⅝

SEAMLESS TUBING

Brass, 19½c. to 20½c. per lb. base.
Copper, 22¼c. to 23¼c. per lb. base.

TOBIN BRONZE AND MUNTZ METAL

Tobin, Bronze Rod	18¾c. net base
Muntz or Yellow Metal Sheathing (14"x48")	16¾c. " "
Muntz or Yellow Rectangular Sheets other than Sheathing	17¾c. " "
Muntz or Yellow Metal Rod	14¾c. " "

Above are for 100 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled)	19¾c.-21¼c. net base
From stock	20¾c.-22¼c. net base

BARE COPPER WIRE—CARLOAD LOTS

15¾c. to 16c. per lb. base.

SOLDERING COPPERS

300 lbs. and over in one order	18¾c. per lb. base
100 lbs. to 200 lbs. in one order	19¼c. per lb. base

ZINC SHEET

Duty, sheet, 15%. **Cents per lb.**

Carload lots, standard sizes and gauges, at mill, 7½c. basis less 8 per cent. discount.

Casks, jobbers' prices	8½c. to 9c.
Open casks, jobbers' prices	9½c. to 10c.

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga. and heavier, base price	**32c.**
Aluminum coils, 24 ga. and heavier, base price	**30c.**

NICKEL SILVER (NICKELENE)

Base Prices

Grade "A" Nickel Silver Sheet Metal

10% Quality	24½c. per lb.
15% "	26¼c. " "
18% "	27 c. " "

Nickel Silver Wire and Rod

10% "	27½c. " "
15% "	31½c. " "
18% "	34¼c. " "

MONEL METAL

Shot	32
Blocks	32
Sheet Bars	40
Hot Rolled Rods (base)	40
Cold Drawn Rods (base)	50
Hot Rolled Sheets (base)	45

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 40 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 35 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. or more, 10c. over Pig Tin. 50 to 100 lbs., 15c. over, 25 to 50 lbs., 20c. over, less than 25 lbs., 25c. over. Above prices f. o. b. mill.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from 75c. to 77c. per Troy ounce, depending upon quantity.

Rolled sterling silver 73c. to 75c.

NICKEL ANODES

85 to 87% purity	42½c. per lb.
90 to 92% purity	45c. per lb.
95 to 97% purity	47½c. per lb.

Supply Prices, June 12, 1922

CHEMICALS

In Commercial Quantities—New York Prices

Acetone	lb.	8-10
Acid—		
Boric (Boracic) Crystals	lb.	.14
Hydrochloric (Muriatic) Tech., 20 deg., Carboys	lb.	.02½
Hydrochloric, C. P., 20 deg., Carboys	lb.	.08
Hydrofluoric, 30%, bbls.	lb.	.07
Nitric, 36 deg. Carboys	lb.	.07
Nitric, 42 deg. Carboys	lb.	.07¼
Sulphuric, 66 deg. Carboys	lb.	.02½
Alcohol—		
Butyl	lb.	20-25c.
Denatured in bbls.	gal.	.36
Alum—		
Lump, Barrels	lb.	.04
Powdered, Barrels	lb.	.05
Aluminum sulphate, commercial tech	lb.	.02½-.03
Aluminum chloride solution	lb.	.20
Ammonium—		
Sulphate, tech., Barrels	lb.	.04
Sulphocyanide	lb.	.50
Argols, white, see Cream of Tartar	lb.	.27
Arsenic, white, Kegs	lb.	.07½
Asphaltum	lb.	.35
Benzol, pure	gal.	.45
Blue Vitrol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate), Barrels	lb.	.05½
Calcium Carbonate (Precipitated Chalk)	lb.	.05
Carbon Bisulphide, Drums	lb.	.07½
Chrome Green	lb.	.36
Cobalt Chloride	lb.	—
Copper—		
Acetate	lb.	.36
Carbonate, Barrels	lb.	.19
Cyanide	lb.	.58
Sulphate, Barrels	lb.	.05¾
Copperas (Iron Sulphate, bbl.)	lb.	.02½
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	3.00
Gold Chloride	oz.	14.00
Gum—		
Sandarac	lb.	.35
Shellac	lb.	—
Iron, Sulphate, see Copperas, bbl	lb.	.02½
Lead Acetate (Sugar of Lead)	lb.	.12-.13
Yellow Oxide (Litharge)	lb.	.09
Mercury Bichloride (Corrosive Sublimate)	lb.	.92
Nickel—		
Carbonate Dry	lb.	.40
Chloride, 100 lb. lots	lb.	.30-.40
Salts, single bbls.	lb.	.10¼
Salts, double, bbl.	lb.	.10¼
Paraffin	lb.	.07-.10
Phosphorus—Duty free, according to quantity		.25-.30
Potash, Caustic, Electrolytic 88-92% fused, drums	lb.	6½
Potassium Bichromate, casks	lb.	.10½
Potassium Bichromate, casks	lb.	.11
Carbonate, 80-85%, casks	lb.	.05
Cyanide, 165 lb. cases, 94-96%	lb.	.50
Pumice, ground, bbls	lb.	.03
Quartz, powdered	ton	$30.00
Official	oz.	—
Rosin, bbls.	lb.	.03½
Rouge, nickel, 100 lb. lots	lb.	.20
Silver and Gold	lb.	.60
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.07½
Silver Chloride, dry	oz.	.86
Cyanide	oz.	—
Nitrate, 100 ounce lots	oz.	.44
Soda Ash, 58%, bbls	lb.	.03
Sodium—		
Biborate, see Borax (Powdered), bbls	lb.	.05½
Bisulphate, tech., bbls	lb.	.03½
Cyanide, 96 to 98%, 100 lbs	lb.	.25
Hydrate (Caustic Soda) bbls	lb.	.04½
Hyposulphite, kegs	lb.	.04
Nitrate, tech. bbls	lb.	.04
Phosphate, tech., bbls.	lb.	.03¾
Silicate (Water Glass) bbls	lb.	2½
Sulpho Cyanide	lb.	.45
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.12-.13
Sulphur (Brimstone) bbls	lb.	.01¾
Tin Chloride	lb.	.31
Tripoli	lb.	.03½
Verdigris, see Copper Acetate	lb.	.36
Water Glass, see Sodium Silicate, bbls	lb.	.02½
Wax—		
Bees, white ref. bleached	lb.	.55
Yellow, No. 1	lb.	.24
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls.	lb.	.14-.18
Chloride, 600 lb. lots	lb.	.06½
Cyanide	lb.	.41
Sulphate, bbls.	lb.	.03½

COTTON BUFFS

Open buffs, per 100 sections (nominal).

12 inch, 20 ply, 64/68, cloth	base,	33.80
14 inch, 20 ply, 64/68, cloth	base,	42.05
12 inch, 20 ply, 84/92, cloth	base,	42.55
14 inch, 20 ply, 84/92, cloth	base,	57.35
12 inch, 20 ply, 88/96, cloth	base,	46.20
14 inch, 20 ply, 88/96, cloth	base,	62.25
Sewed Buffs, per lb., bleached and unbleached	base,	.50

FELT WHEELS

		Price Per Lb. Less Than 100 Lbs.	100 to 300 Lbs.	300 Lbs. and Over
Diameter—10″ to 16″	1″ to 3″	2.60	2.50	2.35
" 6″, 8″ and over 16″	1″ to 3″	2.70	2.60	2.45
" 6″ to 24″	Over 3″	3.00	2.90	2.75
" 6″ to 24″	½″ to 1″	3.60	3.50	3.35
" 4″ to 6″	¼″ to 3″	4.60	Any quantity	
" Under 4″	¼″ to 3″	5.20	Any quantity	

Grey Mexican or French Grey—10c. less per lb. than Spanish, above. Odd sizes, 50c. advance.